INPUT
Presentation
to
IBM CORPORATION

April 20, 1987

**STRATEGIC ANALYSIS OF THE
INFORMATION SYSTEMS MARKET
1986-1997**

INPUT Presentation to

IBM CORPORATION

CONTENTS

INTRODUCTION

BACKGROUND

- **IBM Desires an Independent Cross-Check of Internal Analyses of Markets**

- **Wants Outside Perspectives of IBM, Customers, and Competitors**

OBJECTIVES

- **Draw Together Data and Opinions on Each Segment**

- **Identify Major Trends, Influences**

- **Judge Implications**

- **Identify Segments where IBM May Not be Optimally Positioned**

- **Develop Strategic Alternatives**

- **Make Recommendations**

METHODOLOGY

- **Develop Agenda and Structure**

- **Conduct Structured "Think Tank" Sessions within INPUT**

- **Collect Data: INPUT's Data Bases, Reports, and Library**

- **Apply INPUT Insights to Data**

- **Conduct Telephone Interviews with "Thought Leaders"**

- **Summarize Material and Present Findings to IBM**

DELIVERABLES

- **Presentation**

  - **Overview**

  - **More Detailed Back-Up on Each Segment**

- **Discussion**

- **Data Base**

- **Back-Up Material**

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AGENDA

Part One

- **Application Analysis**

  - **Central**

  - **Departmental**

  - **Individual**

- **Environmental Considerations**

- **Overall Industry Analysis**

- **"Sector" Analyses (one page summaries)**

- **Strategic Implications**

- **Recommendations**

AGENDA (Cont'd.)

Part Two

- **Presentation of Selected Sectors in More Detail, as Desired**

- **Discussion of Any Other Issues of Interest to IBM**

QUALIFICATION AND MINORITY OPINION

- **Where Appropriate, Findings are Labeled:**

    1. **Very Confident, Based on Extensive Knowledge and Data**

    2. **Reasonably Confident, Based on Knowledge and Data**

    3. **Educated Opinion, Based on Judgements of INPUT Staff**

- **Where a Divergence Occurred, Strongly Held Minority Positions are Presented and So Noted**

INDUSTRY PARAMETERS AND APPLICATIONS STRUCTURE

DEMOGRAPHICS

	1986	1997
Enterprises	4,000,000	4,000,000
Large	1,000	2,000
Small	4,000,000	4,000,000
Establishments	6,000,000	7,000,000
Workforce	110,000,000	140,000,000
Large	25,000,000	30,000,000
Small	85,000,000	110,000,000
Departments	20,000,000	30,000,000
Office Workers	60,000,000	80,000,000

DEMOGRAPHICS (Cont'd.)

Number of Systems Installed

	1986	1991	1997
* Micro (in business)	11.5M	23M	40.0M
** Mini	1.3M	3.5M	10.0M
*** Mainframe	33K	50K	100K-200K

Micro = Systems ≤ $15,000 1986
Mini = Systems > $15,000, ≤$350,000 1986
Mainframe = Systems > $350,000 1986

* Every office worker has access to a personal system, at the
  minimum an intelligent telephone. Over half have linked micros.

** Includes PBX Systems in 1991+ timeframe. Every establishment
   over 20 employees has at least one mini.

*** Large growth of supercomputers - every major laboratory has
    one. All organizations with over 500 people have a mainframe.

EXPENDITURE PARAMETERS

Overall Expenditures ($ Billions)

		1986	1997
IS -	Products & Services	$ 135	$ 460
	Labor*	50	150
Telecommunications (excluding data com.)		95	190
	TOTAL	$ 280	$ 800

* **IS Labor**

1.5M IS employees in using organizations at average labor cost of $33,000 in 1986.

2.5M IS employees at average labor cost of $60,000 in 1997

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EXPENDITURE PARAMETERS (Cont'd.)

Expenditure per Worker Per Year

		1986	1997
IS -	Products & Services	$ 1,230	$3,290
	Labor	460	1,070
Telecommunications		860	1,360
TOTAL		$ 2,550	$5,720

EXPENDITURE PARAMETERS (Cont'd.)

Penetration of IS Expenditures Versus Payroll

	1986	1997
IS Expenditures/Payroll	10%	16%
Telecommunications Expenditures/Payroll	3%	4%
TOTAL	13%	20%

Assumptions

$25,000 Total wages/worker 1986
$35,000 Total wages/worker 1997 (3% AAGR)

APPLICATIONS CATEGORIZATION

<u>System Characteristics</u>

Corporate Systems

Data
Rigid
Standardized
Large
Shared by Many

Departmental Systems

Information
Flexible
Localized
Shared by Few

Personal Systems

Knowledge
Individualized
Self-contained
Small

APPLICATIONS CATEGORIZATION (Cont'd.)

- Location/Hierarchy

    - Determined by "Fit" in Hierarchy

        . Usage

        . Geography

        . Data Base Sharing

        . Volume, etc.

    - Over 10 Years

        . Host Shrinks to a Node, Then Expands

        . Department Nodes Increase in Power

        . Individual User Shifts to Network

    - 1990s Organization "Flattening" will Squeeze Departmental Systems

CENTRAL (CORPORATE/DIVISION) SYSTEM

- High Professional Development Content

- Two Types of Applications

  - True Corporate Systems (e.g., Consolidation)

  - Interdepartmental Systems (e.g., CIM)

- Hub for Corporate Processing Until the Network
  Becomes the System

- Data is Primary

- Large Future SI and Network Support

- Information Center

- Electronic Mail Hub
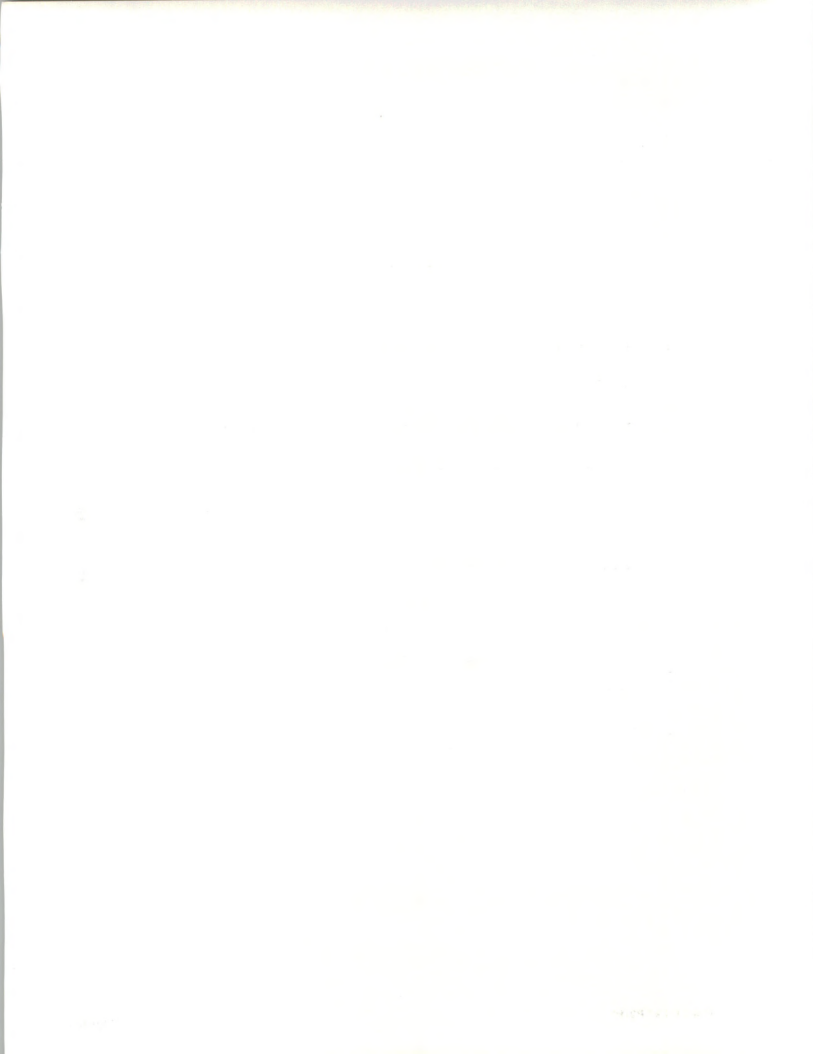
DEPARTMENTAL SYSTEMS

- Dedicated to Department, Closely Related Tasks

- Battle between DDPers and Centralists

- Within Departments, LAN-Based PCs versus Minis

- Operating Departments Under Pressure Want Control

- Applications can be Generic, Department-Specific or Industry-Specific

- General Office Activities will be Integrated with Specific Applications

- Fast-Growing DBMSs

- Fourth Generation PBXs are Departmental Systems of Future

- Minis Less Subject to Rapid Obsolescence

INDIVIDUAL (PERSONAL) SYSTEMS

- Usage will Continue to Emphasize Document Preparation, Local Analysis, Ad Hoc Reporting, and Information Retrieval

- Standalone Personal Systems will Remain in the Majority in the Near Term

- Establishing Connectivity over the Base is Currently Difficult

- High Individualization of Accessing and Work Methodology is Allowed

- Power will be used to Mold Personal Interface to an Internal Standard, Making it Transparent to User

- Multitasking, Multifunction, Multiaccess will be Required

WHITE COLLAR SALARY PROFILE
($ BILLIONS)
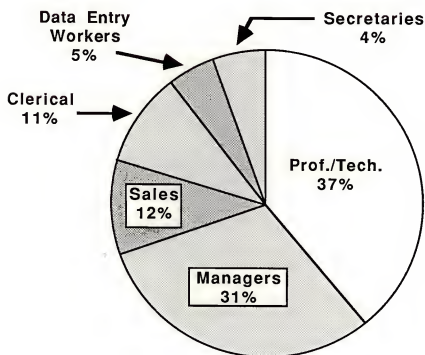
1986 Total: $1,500 Billion

OFFICE COSTS BY ACTIVITY

Clerical Tasks
$95B.

Communications
- Telephone
- Meetings
$600B.

Analysis
&
Decision
Making
$330B.

Information
Handling
$475B.
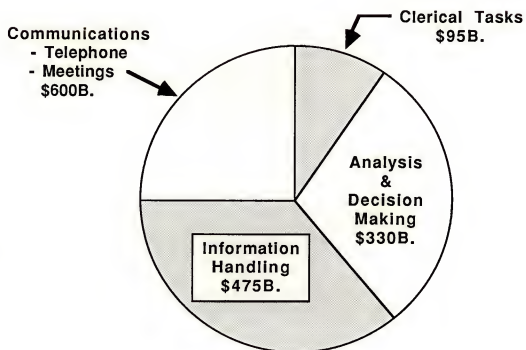
1986 Total: $1,500 Billion

OFFICE SYSTEMS

- Current Labor Expenses in Office Equal $1,500 Billion for 60M Workers

- Projections Show 80M Workers in 1997 if Nothing is Done About it

- Professional and Technical Office Functions Growing Rapidly

- Great Potential for Cost Reduction in Information Handling and Communication

- Extremes are Currently Being Attacked: AI and Clerical

- Waste in Office Exceeds Entire Cost of IS

- Key to IS Success is Reducing Office Labor Cost

- Importance of Communications Shows Threat from Telephone

- Office Expenses Addressable at Departmental Level

- Offices are Communicating Functions; Basic Functions Subject to "Electronification"

CONCLUSION

- IS Has Just Scratched the Surface of its Potential

- Realization of that Potential is a Social/Political Question, Not Technological

- In Terms of Relative Position IS in Business is at the Stage that Agricultural Equipment was in the 1890-1910 Era

  - Growing Workforce (Office Workers)

  - Increasing Use of Work Animals (Office Equipment)

  - Increasing Use of Mechanization (Electronification)

- Subsequently, 1920 to 1960

  - Rapid Decline in Employment

  - More Rapid Decline in Obsolete Aids

  - Exponential Increase in Machinery

- Waste in Office Greater than IS Expenditures

- IS Contributes at the Moment to Waste

- IS will Restructure Business/Industry if Allowed

  - If this Happens there will not be 80 Million Office Workers in 1997

AN EXAMPLE OF TECHNOLOGICAL SUBSTITUTION

× Agricultural Employees (Millions)
+ Farm Machinery Horsepower (Thousands)
O Work Animals Horsepower (Thousands)

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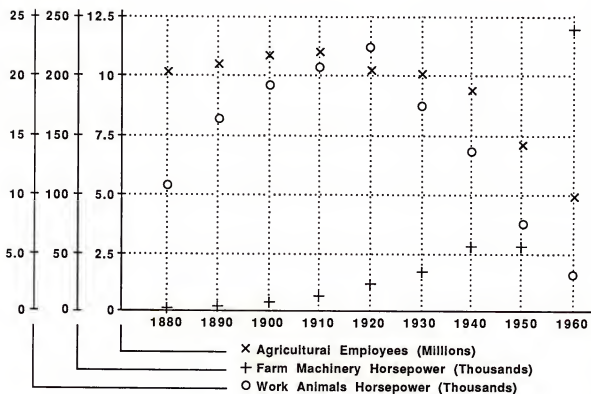
ENVIRONMENTAL CONSIDERATIONS

GENERAL
ECONOMIC ENVIRONMENT

- Average Inflation Rate 3% Per Annum

- Average GNP Growth of 2% Per Annum

- Total Employment Increase

- Increasing Rate of Creation of Service Jobs

- "Real" Unemployment Creeps Up

ECONOMIC ENVIRONMENT (Cont'd.)

Implications

- "Feedback" Mechanism Accelerates Systems Need

- Steady Growth of Automation - Physical Activity

- Systems Growth to Support More Workers

SOCIAL ENVIRONMENT

- **Degradation of Quality and Dependability of Work Force**

- **Lack of Adequate Education and Training**

- **Increasingly Litigious Society**

- **Ten-Year Lag in Attitudes of Work Force to Those of Young - a) 1967-1977, b) 1977-1987, c) 1987-1997**

- **Emergence of Two-Tier Society Plus "Staff" Functions (Professionals)**

- **Emphasis on "Risk Reduction"**
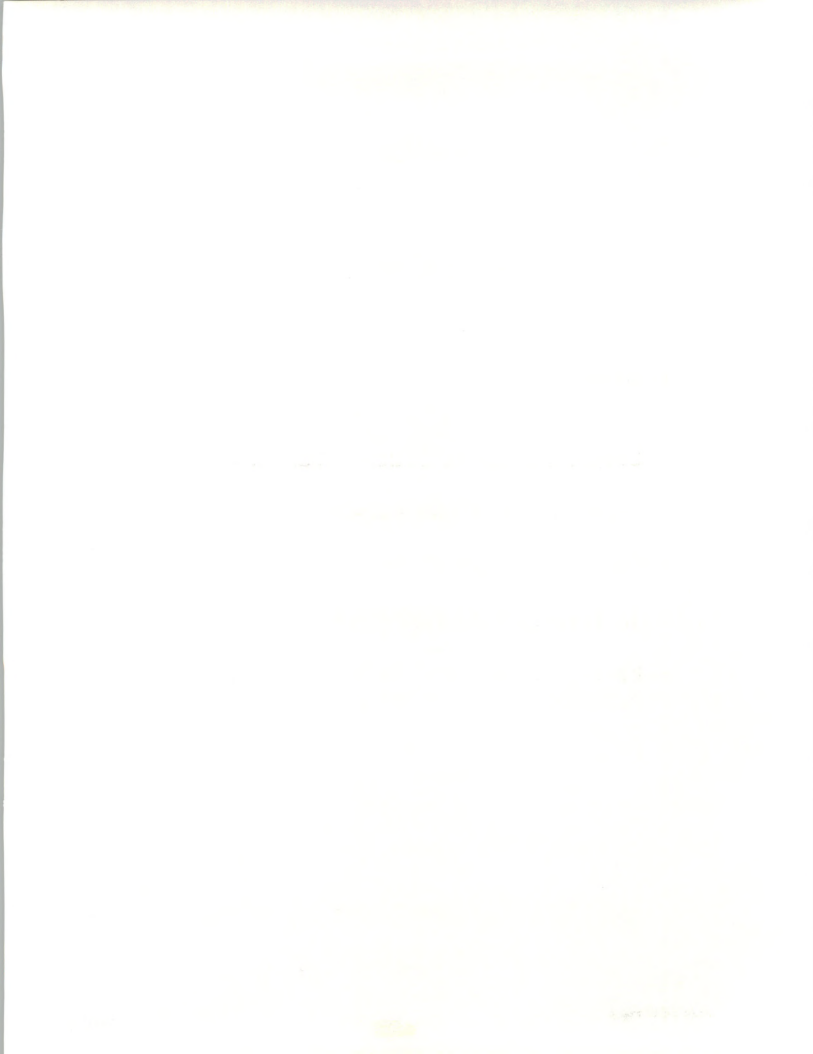
SOCIAL ENVIRONMENT (Cont'd.)

<u>Implications</u>

- **Systems Grow to Support Increasingly Stressed "Upper Tier"**

- **Systems Grow to Replace/Amplify Skills of "Lower Tier"**

- **Systems to Support/Replace Professionals**

- **Systems Implementation Increases in Difficulty**

POLITICAL/GOVERNMENT REGULATORY ENVIRONMENT

- **Deregulation at Low Point**

- **Government Growth Continues - Absorbs Talent and Capital**

- **Major Government Projects**

- **More Restrictions on Information and Systems**

- **Legislation Drives Systems Changes in Private Sector**

POLITICAL/GOVERNMENT
REGULATORY ENVIRONMENT (Cont'd.)

Implications

- Slowdown in IS Market

- Major Opportunities in 1990s

- Slowing of Industry Outside Government

- Changing Systems Required

FINANCIAL/INDUSTRY STRUCTURE

- **Industry Restructuring Continues Through M&A and LBOs. Results in Redundancies and Systems Failures**

- **"Outsourcing" (The Hollow Company) Continues**

- *Minority*: **Manufacturing Moves Back into U.S. - a) Cost of Distribution, b) Reduced Labor Content, c) Response to Volatility**

- **Changing Organization Emphasis - Product or Process Rather Than Function**

- **Emphasis on Short Term - a) Lack of Management Vision, b) MBA Mentality**

- **Increasing "Sheep-Like" Management "Fits and Starts" - Responding to Fads**

- **Emphasis on Marketing - New Methods of Sales**

FINANCIAL/INDUSTRY STRUCTURE
(Cont'd.)

<u>Implications</u>

- "Retooling" of Systems Spurs Demand

- Consolidation of IS Departments Reduces Demand

- Changing Organization Means Functional Systems Obsolete - Need for New Systems

SYSTEMS DEMAND ISSUES

COMPETITIVE ADVANTAGE

- **Volatility of Markets Increases Requiring New Support Systems**

- **"Mission Critical" Concept Increasingly Accepted - Emphasis on Front-End Systems**

- **Demand for Timely (Real-Time) Information to Support Decisions**

COMPETITIVE ADVANTAGE (Cont'd.)

Implications

- **Problem of IS Definition in Fluid Environment**

- **Competitive Advantage/Mission Critical Systems are High Risk - Therefore Slow Growth**

- **Fundamental Demand Growing and Unsatisfied**

- **Volatile IS Markets**

- **More Flexible Systems**

PRODUCTIVITY

- **Productivity Overall Increases**

- **Reduction of "White Collar" Work Force**

- **Compression of Organizations**

- **Movement of Productivity Systems to Point of Work (POW)**

- **"Japanese Model" - Technology Plus People Equals Productivity**

- **Manufacturing Productivity Increases**

- **For IS: "Where is the Productivity?" - No Measuring Systems**

PRODUCTIVITY (Cont'd.)

<u>Implications</u>

- **Substitution of Systems for Labor - a) Large Concentrations First, b) Attack on High Cost Segments**

- **IS Moves Out Through Networks to Workers, Customers, Suppliers, and Governments**

- **IS Slowed Through Lack of Demonstrable Benefit**

INFORMATION PRODUCTS/SERVICES

- **Increasingly Information-Intensive World - Information Consumption**

- **Extension of Data Collection Systems into Information Products**

- **Extension of Internal Information Delivery Mechanisms into External Services - e.g., UAL, AMR - New Network "Spinoffs"**

- **Transfer of Non-Electronic Systems into Electronic Systems, e.g., EDI, Telephone Directory**

INFORMATION PRODUCTS/SERVICES
(Cont'd.)

<u>Implications</u>

- **Supply Stimulating Demand, Resulting in New Systems/Service Use**

- **More Companies Participating in "For-Profit" IS Activities**

"ELECTRONIFICATION"

- **Creation, Exchange, and Storage of Information Becomes Wholly Electronic**

- **Transfer of Communications to Computer Telecommunications Networks - a) Transactions, b) Information**

- **Level 1 - Transfer of Medium, e.g., Letter to FAX, Order to Electronic Document Interchange, Storage of Document Image**

- **Level 2 - Transfer of Process, e.g., Direct Entry into Electronic Mail, Order to Electronic Data Interchange, Storage of Information Including Voice Annotation, Comments, Etc.**

- **Audit and Legal Process Lags Technology - Security Issues**

- **Competitive Pressures Dictate Cost Reduction, Efficiency Improvement, Reduced Handling, More Timely Information, Broader Sharing, and Upstream and Downstream Linkage**

- **Issue of Control - Who Owns the Data?**

"ELECTRONIFICATION" (Cont'd.)

Implications

- **Restructuring of Systems May Actually Reduce Processing Requirements - Capture Once versus Many Times**

- **Vast Increase in Network Use - Could Become Overburdened**

- **Changing Way of Doing Business Drives New Systems**

- **Transfer Requires Systems to be Transparent, Interactive, Responsive, Flexible, and Simple**

- **Need for Standards**

- **High Risk - May Focus Attention on Real Time Not Strategic Concerns**

STRATEGIC INFORMATION NETWORKS

- **Network Regarded as Corporate Asset**

- **Battleground Among Competitors Will be in Networks, e.g., Airlines, Banks, Insurance Companies, Distribution**

- **"Ownership" of Network Outlet Target - "Trojan Horse" Syndrome**

- **High Cost/High Risk**

STRATEGIC INFORMATION NETWORKS
(Cont'd.)

Implications

- **Massive Expenditures on Private Networks**

- **"Private Label" Networks**

- **"Connectivity is the Name - Networks are the Game"**

- **Risk Reduction Contracts/Processes - a) Implementation in Stages, b) Raises Costs and Postpones Benefits, c) Strains Resources**

INFORMATION SYSTEMS ISSUES

ROLE OF I.S. DEPARTMENT

- **Consultant and Advisor - Top Management - Strategic IS Issues - Directly or Separately Through CIO**

- **Consultant and Advisor - Divisions/ Departments. Assisting in Adapting IS to Their Needs**

- **Consultant and Advisor - Individuals. Provide Education/Training, Support, and Problem Solver**

- **Standard Setter - Critical Function - Qualifies New Products/Services**

ROLE OF I.S. DEPARTMENT (Cont'd.)

- **Increasingly Internal Vendor - Sells Corporate Systems and Services**

- **Network Operator/Protector - Possibly Only Ownership Role**

- **Corporate Data Manager - Consolidates Information and Protects Corporate Data**

- **Corporate Software Manager - Builds Software Library, Protects Investment, and Ensures Quality**

ROLE OF I.S. DEPARTMENT (Cont'd.)

- Innovator - R&D Role, Focal Point for New Systems and New Organizational Activities

- Focal Point for New, Cross-Functional Systems, Especially Mission-Critical Systems

STRUCTURE OF I.S. DEPARTMENT

- **Increases in Stature - Less Often Dominated by Finance**

- **Less Operational - More Staff. Operational Functions Distributed**

- *Minority*: **More Operational in Future. As Organizations Change, Only Central Function Can Force IS Change Over Vested Interests**

- **Business Knowledge Increases Over Technical Knowledge**

STRUCTURE OF I.S. DEPARTMENT (Cont'd.)

- CIO Job Increasingly Normal Job Rotation - Result Less Technical, IBM-Oriented

- Budgets and Buying Will Migrate to Business Entities with P&L Responsibility

- Increasing "For-Profit" Component. Some May Spin-Off All IS Operations

- Spin-Offs to Split. Internal Stay Inside, External Become True Vendors

- Within IS, Less Functional Organization, More Business/Customer Orientation

DISTRIBUTION OF I.S. CAPABILITIES

- **Application Development. Increasingly Responsibility of Operating Organization Unit Except When Corporate Asset**

- **Many Applications Only Locally Relevant - Observe Interface Standards, Preprocess Data, Feed Digestible Information Onward**

- **Counter Force - Lack of Prior Knowledge of Information Need Militates in Favor of Central Information Location**

- **Counter Force - Companies Will Discover Too Much "Hacking" - Time and Resources Frittered Away at User Level**

DISTRIBUTION OF I.S. CAPABILITIES
(Cont'd.)

- **Information Processing and Storage Will Migrate Outward from Hub (POW Systems)**

- **Polyprocessor Systems - Offload Applications from Mainframe to Local Systems. These Systems are Then Tuned to Local Need**

- **Demonstrable Productivity Improvements Only in Decentralized Systems. Focus Provides Clear Evaluation, e.g., Engineering, Directory Inquiries**

- **Individual Participation - Internal and External - Interactivity Crucial - Standard Interfaces - People Mobility Issues**

I.S. EXPENDITURE PATTERNS (BUDGETS)
(INCLUDING PERSONNEL,
MAINTENANCE, ETC.)

	AAGR		
	S	**I**	**L**
• Central Systems	9%	9%	9%
• Intermediate Systems	12%	15%	17%
• End-User Systems	10%	15%	16%

I.S. EXPENDITURE PATTERNS
(Cont'd.)

- **Growth Areas - Networks, Office Systems, Operational Automation, Internal/External EDI**

- **Integration of IS with Functional Activities Makes Actual Expenditure Patterns Difficult to Measure**

- **Supply Limitations - Products and Services Not Available to Meet Demand**

BUYING PATTERNS ("MAKE" VERSUS "BUY")

- **Distribution of Purchasing Authority Makes Sales Process/Account Control More Expensive and Difficult**

- **Buying Process Changes - Team Task Force Decisions, More Types of People Involved, More Testing, "Fly-Offs" Required**

- **IS Prequalifies Products/Services - Makes Buying Decision Simpler at Periphery**

BUYING PATTERNS (Cont'd.)

- "Make" versus "Buy"

    - IS Department High Risk Because of
      Limited Experience (One Organization),
      Poor Track Record, Lack of Business
      Knowledge, and No Contractual Recourse

    - Outside Vendor Less Risk, Multiple
      Experiences, Subject Knowledge,
      Contractual Responsibility

    - Control Retained by Internal People,
      Maybe Not IS

BUYING PATTERNS (Cont'd.)

- "Buy" Choices - a) SSS (Single Source Solution), b) SPA (Single Point Accountability), c) Multiple Vendors

- Applications Development Increasingly Vendor Originated - Competence, Experience, Shared Cost, Innovation, Complexity

- Different Sources - a) Standard = Product, b) Specific = SI or Professional Service, c) SPA Move to SSS Over Time

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APPLICATIONS ISSUES

PEOPLE AVAILABILITY

- Continued Increase in the Number and Depth of Skills Needed in the IS World - Increased Specialization

- Rapid Growth in Number of IS People Needed to Develop, Implement, Operate, Maintain, and Support Systems. Drivers at all levels--Corporate, Departmental, and End-User

- People are Gating Factor to Growth of IS

PEOPLE AVAILABILITY (Cont'd.)

- **Shortage of People is a Long-Term Problem. The Industry has Constantly Expected a Short-Term Solution**

- **Education/Training System Will Not Produce the Required Work Force**

- **Motivation Also Lacking. Most Young People Want to Use Computers, Not Develop Systems**

APPLICATION DEVELOPMENT/MAINTENANCE METHODS

- Market for Tools and Techniques to Increase Productivity of IS Will Expand Rapidly--CASE, Software Productivity Tools, FGLs, AI/Expert Systems, etc.

- IS Industry Will Reach Out to:

    - Retrain Retired or Displaced Workers

    - Use Offshore Sources, e.g., India

    - Accommodate Home Help Through Telecommuting, Flexible Conditions, etc.

    - Use Temporary Help Agencies

APPLICATIONS DEVELOPMENT (Cont'd.)

- Development Will Increasingly Involve the User, Particularly Analysts in User Departments (Distributed Systems Developers)

- Mixture of Approaches Will be Adopted, Especially a Combination of Professional Service and Software Packages

- Emphasis Will Increasingly be Placed on Quality of Software. Biggest Current Lack; e.g., SDI Problems

- Post-Installation Support Will Increase in Importance

- Improved Development Methods Will Favor Total Systems Development Projects versus Piecemeal Approaches of the Past

MATURITY/LIFE CYCLE OF APPLICATIONS

- **In Large Enterprises Many Applications Are on Third Generation Now. Small Enterprises, Especially Very Small Ones, Are on First or Second**

- **New Applications Are Still Being Developed at All Enterprise Sizes. This Will Continue through 1997 as Technological Thresholds Are Crossed**

MATURITY/LIFE CYCLE OF APPLICATIONS
(Cont'd.)

- **Majority of Applications Being Developed by 1997 Will be Replacements**

- **Life Cycle of Applications Will Decrease at All Levels. Impacts:**

  a) **Some Applications Will Become Disposable, i.e., No Maintenance**

  b) **Maintenance/New Development Mix Will Alter in Favor of New Development**

MATURITY/LIFE CYCLE OF APPLICATIONS
(Cont'd.)

- Flexibility of Software Will be a Counterforce Allowing Easier Maintenance and Wider Use of An Application

- Change of Organizational Emphasis from Functional to Product/Service/Customer Makes Current Software Obsolete.

    - 90% of Installed Base Obsolete ($300 Billion)

    - Will Take 10 Years to Replace (at $50 Billion/Year)

MATURITY/LIFE CYCLE OF APPLICATIONS
(Cont'd.)

- **Penetration and Maturity of Applications Varies by Type**

  - **Financial and Administrative - High**

  - **Operational - Medium**

  - **Office/Factory Floor/Laboratory - Low/Medium**

  - **Personal Productivity - Low/Medium**

- **Applications Will Increasingly Replace Human Activities; Today They Enhance Them. This Is the Untapped Potential of "Informatics." Activities Replaced Will be First Mental Then Physical**

STANDARDS

- **Development of Standards by "Regulatory" Bodies Will be Slow. Resistance from Vested Interests Strong. Inertia from Bureaucratic Process High**

- **Standards Are Important to the Development of Many Markets, e.g., EDI, ISDN. A Countervailing View Is That Software Can Address Many Incompatibilities, e.g., SNA and X.25**

STANDARDS (Cont'd.)

- **Many De Facto Standards, e.g., SQL, DB2, UNIX, in Certain Segments**

- **Communications is the Area of Most Need for Standards--Analagous to Railroads, Highways, etc.**

- **Open Systems Concepts Will Also Develop Slowly - Users Are Not Interested**

- **Relatively More Important in Large Enterprises**

SECURITY

- **Growing Problem Which Is Not Being Adequately Addressed**

- **Could be the "Sand" in the Engine of Progress**

- **Proper Security Will Become a Competitive and Legal Requirement**

- **Information Assets Must be Protected from a) Theft, b) Harmful Interdiction, c) Failure through External Causes**

SECURITY (Cont'd.)

- **Undoubtedly More Damage Than Meets the Eye**

- **Major Catch-Up Effort in the Intermediate Timeframe**

- **Lacks Awareness, Exposure and Focus. Encryption Almost Totally Useless. Non-Issue to Almost Everyone Except in Networks/Financial Transaction Systems**

OTHER APPLICATIONS ISSUES

- **Applications Integration**

  - **Scorekeeping for Humans - Process Support**

  - **Enhancement of Human Activity - Process Automation**

  - **Change or Replacement of Human Activity - Process Redesign**

- **As Progress Up the Scale Absorption Problem Increases Exponentially: Numbers and Types of People Affected, Processes and Procedures Changes, Implementation and Conversion Costs**

OTHER (Cont'd.)

- Integration - Three Areas of Integration -
  a) Technology, b) Applications, c) Business
  Function, Including Enterprise

- Ownership of Application/Information
  Question. If One Unit of an Organization
  Develops Software/Information Base, Who
  Else Can Use It and Under What
  Conditions?

OTHER (Cont'd.)

- **Reusable Code: Techniques to Enhance Reuse of Design and Development Efforts Will Develop Slowly**

- **Libraries of Software. Organizations Will Establish Automated Libraries of Applications and Modules for Reuse, Ultimately Leading to Automated Software Generation (ASG)**
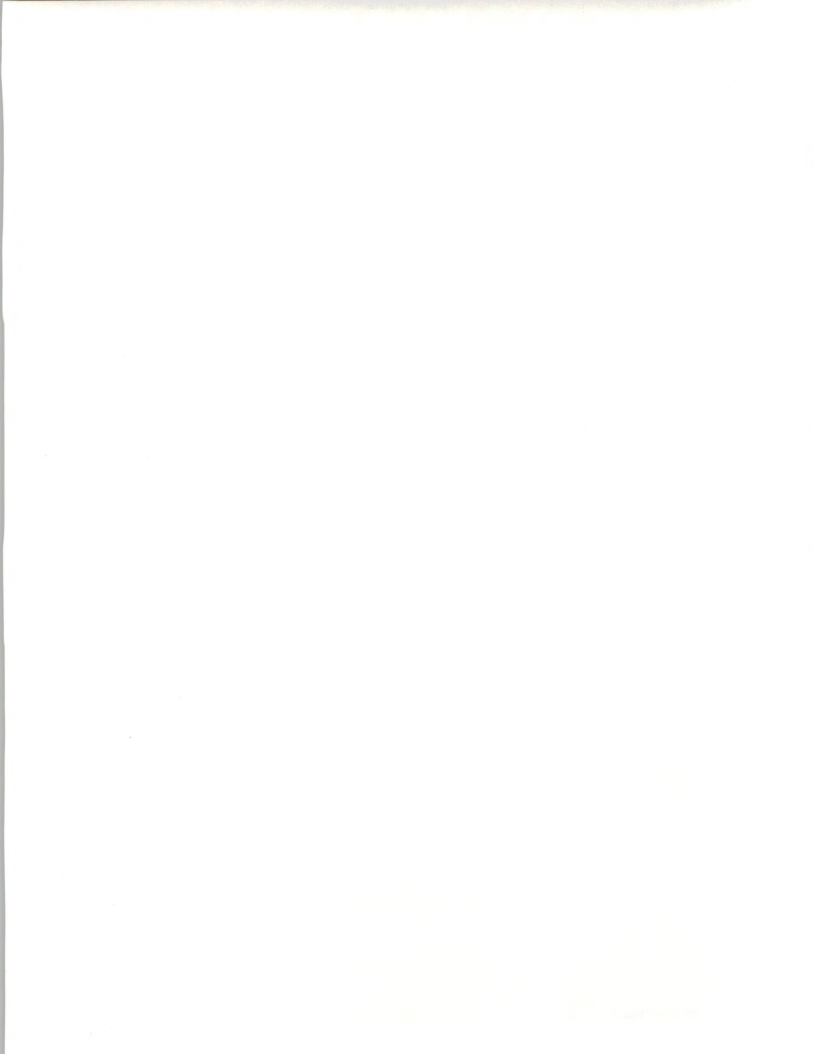
OVERALL INDUSTRY ANALYSIS

APPLICATIONS/USAGE TRENDS

- **Connectivity (Electronification)**

- **Strategic Applications**

- **Integration/Breadth of Applications**

- **Distribution of Data and Processing**

- **User Interface Improvements**

- **Hierarchy of Individualization**

- **Application Development Backlog**

- **Shorter Life Cycle of Applications**

TECHNOLOGY TRENDS

- **Evolutionary Improvements in Computers**

- **Revolutionary Computer Improvements**

  - **Super Conductivity**

  - **Optical Systems**

  - **Radical Architectural Changes**

- **Standards**

  - **Mandated**

  - **De Facto**

- **Communications Improvements**

  - **Transmission**

  - **Digitized Voice/Data/Text/Image**

- **Man-Machine Interface**

SOFTWARE TRENDS

- **Distributed Information Management**

- **Artificial Intelligence**

- **User Interface**

- **Individualization**

- **"Standards": De Facto Will Dominate**

- **Computer-Aided Systems Engineering**

- **Systems Software Functions Going Inboard**

MARKETPLACE TRENDS

MARKETING, DISTRIBUTION, AND SUPPORT

- Focus on the Customer

- Marketing-Driven Industry

- Complexity Increasing

    - Pressure on Channels

    - Increased Service Component

    - Increased R&D Funding

- Trend to Value-Added

- Reduced Prices, Thinner Margins

COMPETITION

- **Mergers and Acquisitions**
  - **Smaller Players Merge or Specialize**
  - **Big Players Acquire Specialists**
  - **Strategic Partnering Problems**
- **Continued New Entries**
- **Foreign Competition to Increase**
- **Deregulation Creates New Competitors**

IMPLICATIONS: TRADITIONAL IS MARKETS

- **Steady Erosion of General-Purpose Hardware Value and Profitability**

  - **Manufacturing Process Less Important**

  - **Design is Real Value**

  - **Hardware/Software Integration a Key**

- **Market-Driven Custom Systems will Emerge (Within Standard Interface Context)**

- **Increasing Value in Systems Software**

- **Systems Software Remains a Significant Entry Barrier**

- **Communications Dominates Computation (Except in Very Small SEs)**

- **Exponential Increase in Storage Requirement**
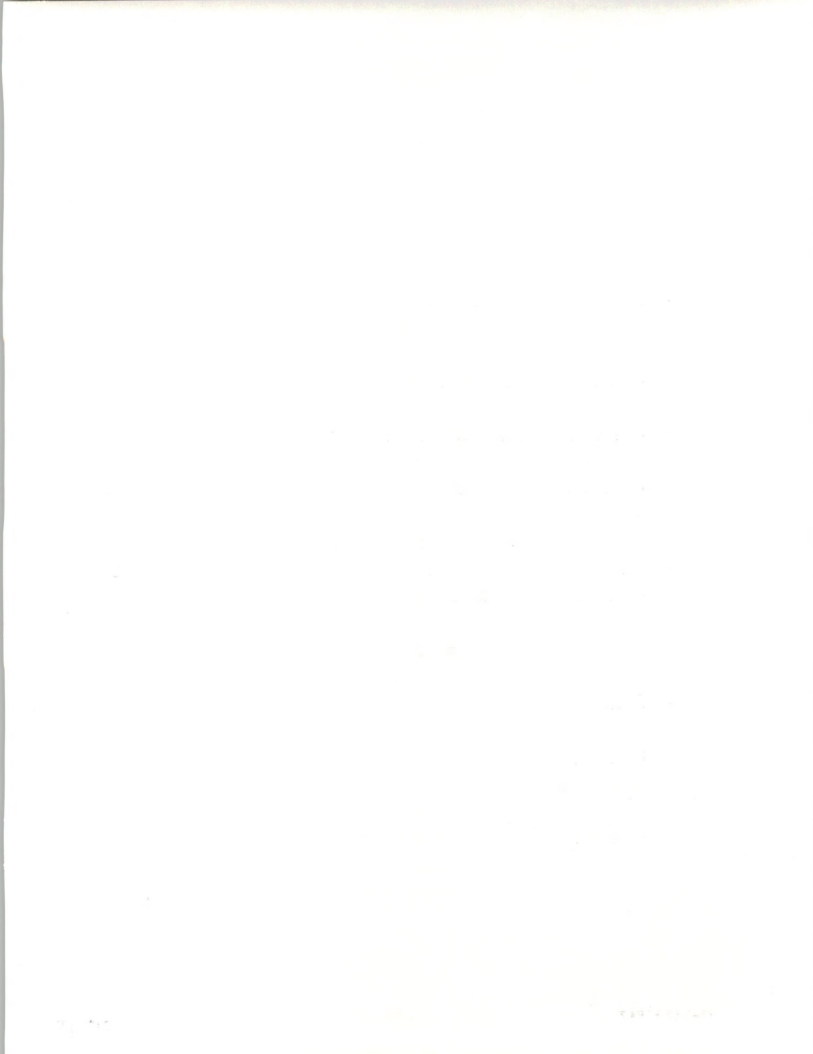
IMPLICATIONS: TRADITIONAL IS MARKETS
(Cont'd)

- **Battleground is at the Departmental Level (In SEs this Could be the Whole Company)**

- **Connectivity and DIRM Predominate**

- **SE Markets Will Grow Faster than LE**

- **Education and Training are Automation Targets, Especially in SEs**

- **Maintenance Revenue Growth Will Slow, Margins Decline**

- **Support Services Loom in Importance**

- **Account Control Derives From:**

  - **Sales/Marketing (at Ever-Increasing Cost)**

  - **Software**

  - **Support**

IMPLICATIONS: OTHER IS MARKETS

- **Software and Services Increase in Importance...It's the Chef, Not the Stove that Makes the Meal.**

- **Big Bonuses for Value-Added in:**

  - **Large, New, Precedent-Breaking Applications**

  - **Application/Industry Problem-Solving Expertise**

  - **Large System/Network Integration**

    - **In-House for LEs**

    - **Via Turnkey and RCS for SEs**

IMPLICATIONS: OTHER IS MARKETS (Cont'd)

- OIS

- Overall Connectivity

- Overall Data Management and Accessibility

- Communications Services Could Ultimately Dominate the Business

- Prime/Sub Relations Expand Dramatically

- Attempts to "Corner the Market"

- Critical Skills Inventory Becomes Differentiator

- Ownership of Information is Where the Value Resides

- Capitalization of these Businesses is a Big Question

SPECIAL IMPLICATIONS

- 1987 Make versus Buy Decision Ranges from Writing Applications to Buying Packages and Professional Services

- 1997 Make-Buy Spectrum Starts at Manufacturing Custom VLSI Chips on One Hand to Renting Everything from Handsets through the P&L and Balance Sheet from a Vendor

- To be Dominant in the LE Game, a Vendor May Have to Offer this Entire Range
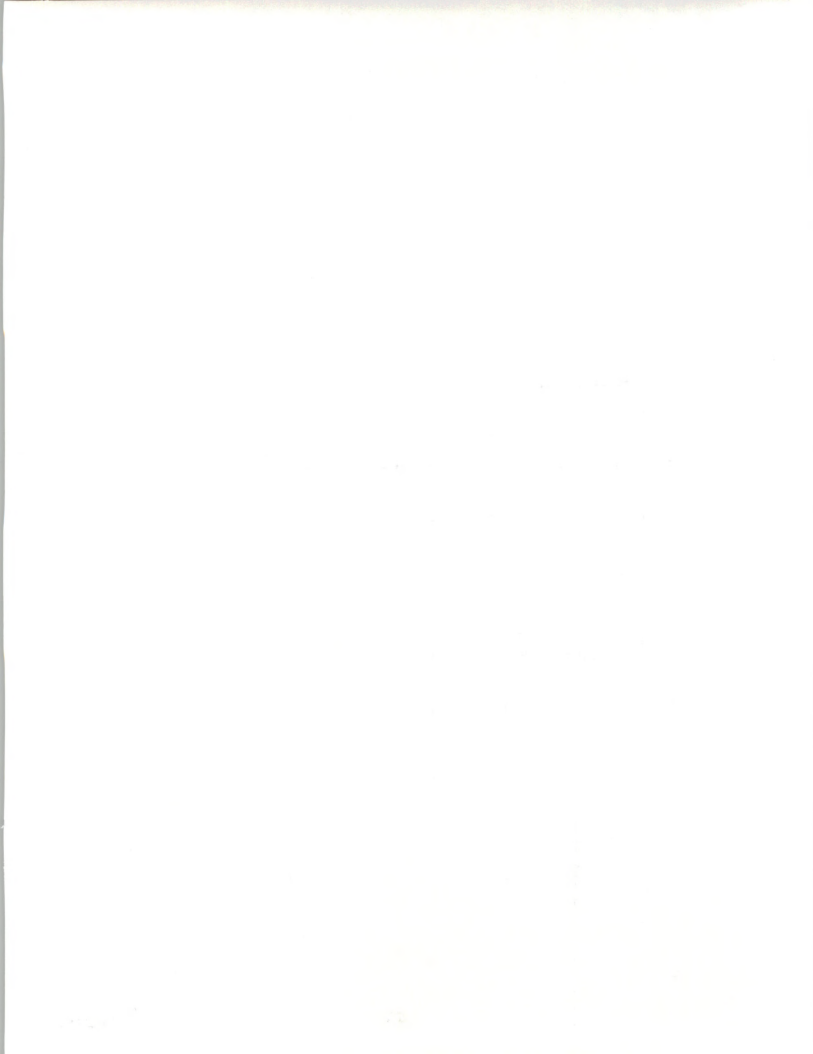
INDUSTRY SIZE AND GROWTH
($ Millions)

Traditional IS P&S (2)

LE

		1997
10%	181,309	
10%	112,470	
10%	83,955	
	62,989	

Other IS P&S (1)

LE

		1997
12%	119,020	
14%	66,616	1992
16%	44,035	1989
	28,093	1986

Traditional IS P&S (SE)

		1997
12%	101,342	
11%	58,710	
10%	43,314	
	32,721	

SE

Other IS P&S (SE)

		1997
13%	74,535	
14%	40,062	1992
15%	26,795	1989
	17,764	1986

SE
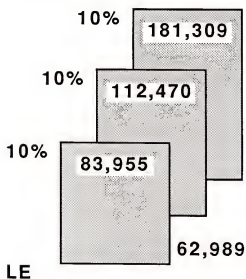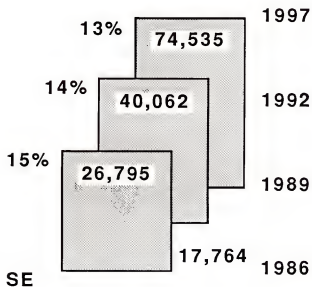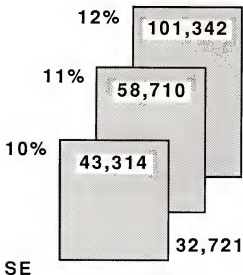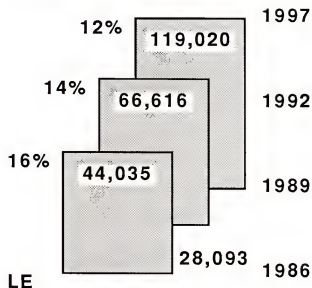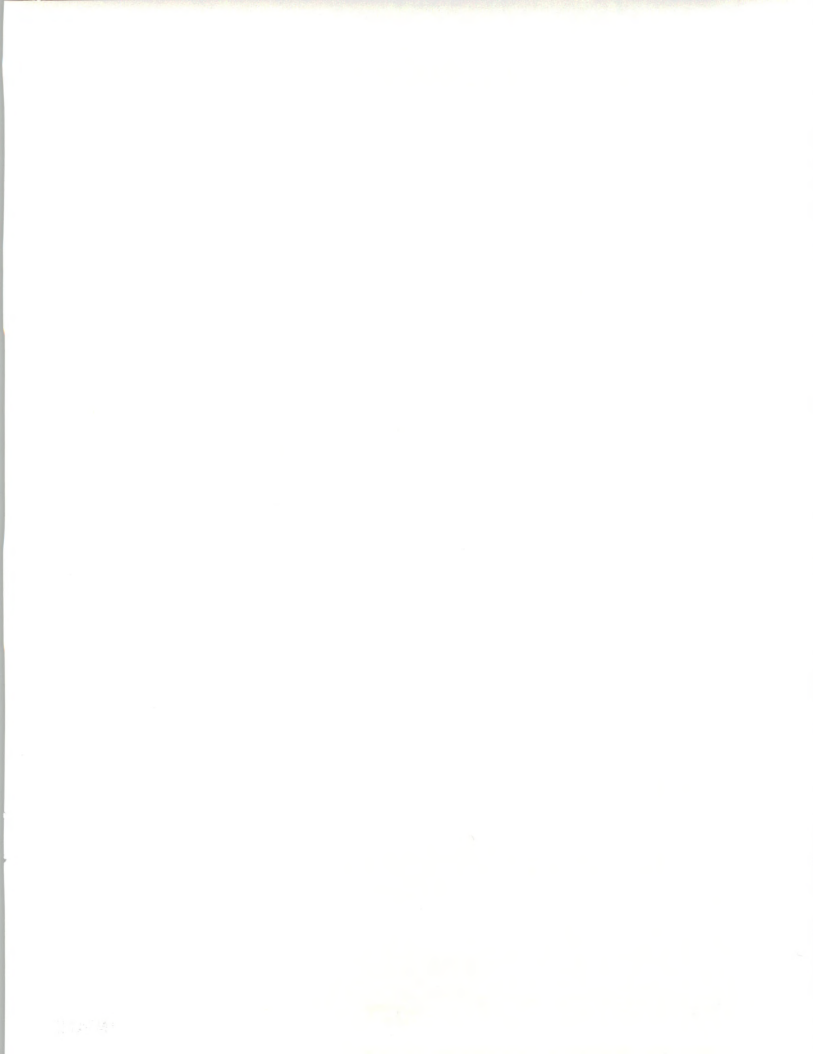
SECTOR ANALYSIS
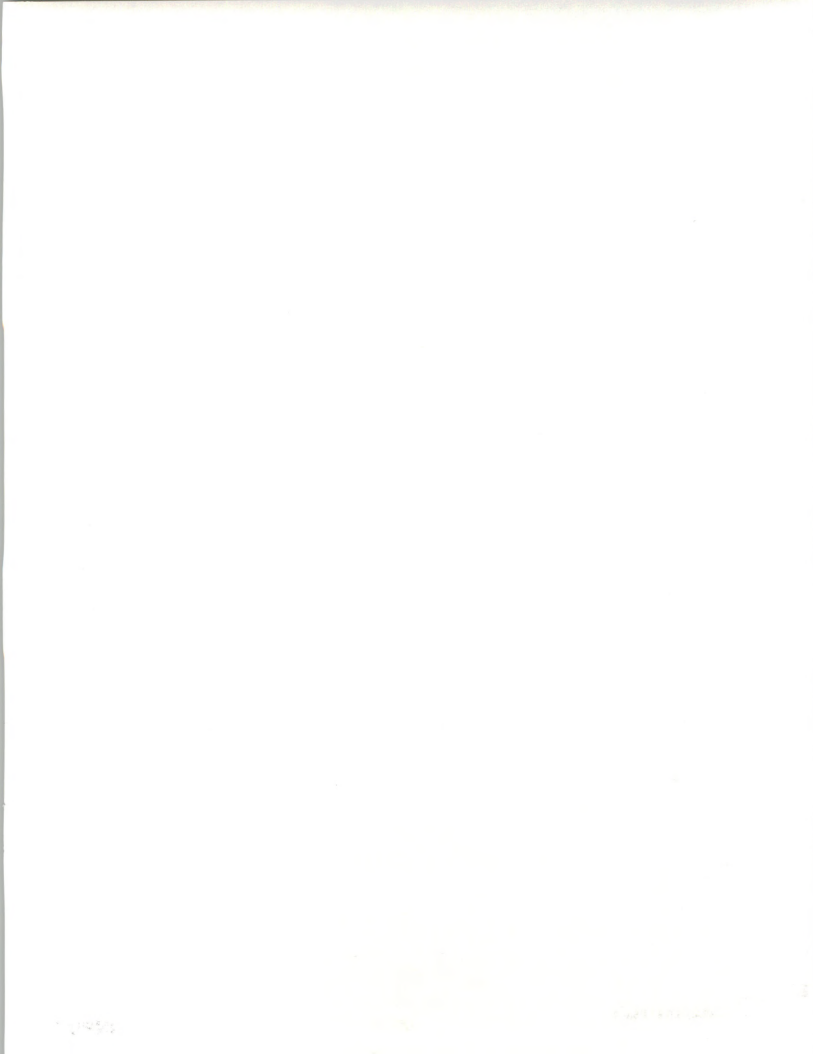
Where Appropriate, INPUT's Assessments of Strength and Effect of Various Influences Have Been Quantified for Quick Visual Reference in Notations on Right Margins as Follows:

	Short Term 1986-1989	Intermediate Term 1990-1992	Long Term 1993-1997
Impact	1-5	1-5	1-5
Market Effect	-0+	-0+	-0+

Impact = 1 Low, 5 High

Market Effect = - Negative
0 Neutral
+ Positive

LE = Large Enterprise, >5,000 Employees

SE = Small Enterprise, <5,000 Employees

TRADITIONAL IS PRODUCTS AND SERVICES
LARGE SYSTEMS (2)

- Growth Drivers

  - Supercomputing For New, Precedent-
    Breaking Applications

2	3	4
+	+	+

  - Data and Network Management for
    Very Large Networks

3	4	5
+	+	+

  - Dramatic Price/Performance
    Improvements

3	4	4
+	+	+

- Growth Inhibitors

  - Distributed IRM

1	3	5
0	-	-

  - Migration of Data and Processing
    to Department/Work Group/
    Individual Level

1	3	5
0	-	-
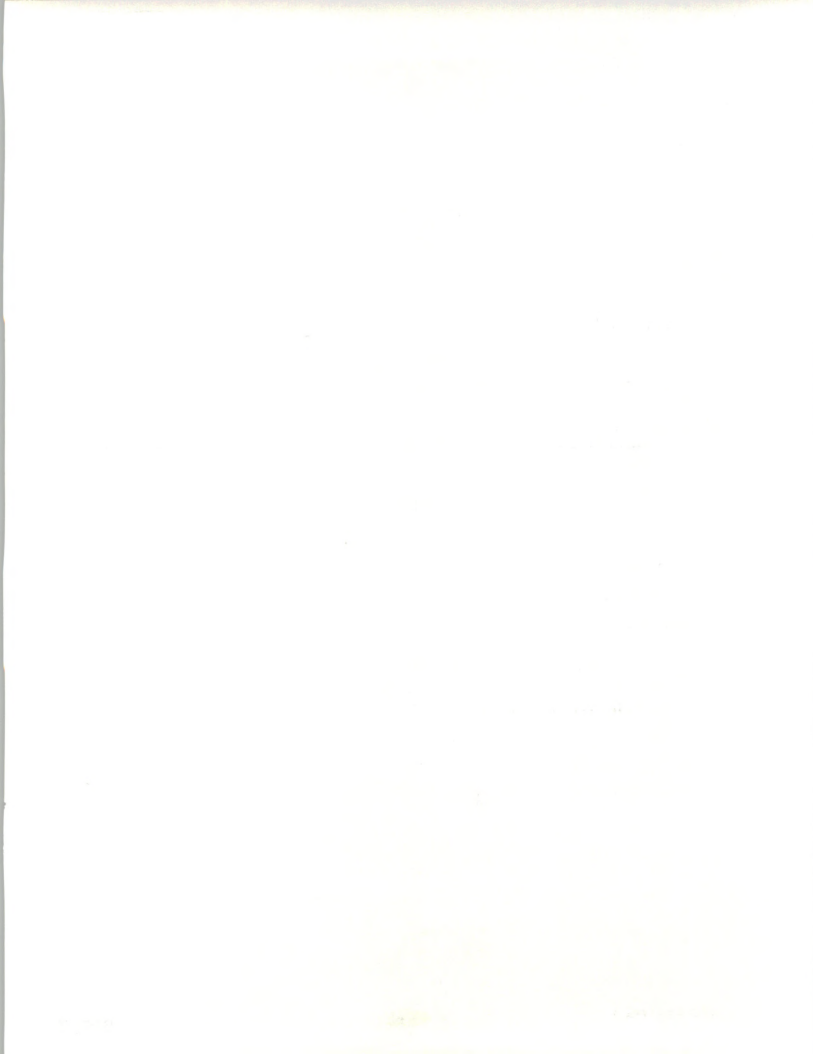
MARKET SEGMENT FORECASTS

A. TRADITIONAL INFORMATION SYSTEMS PRODUCTS AND SERVICES

1.   LARGE SYSTEMS (greater than $1,750,000) **(2)**

---

a.   <u>Definition</u>

- CPU, memory, and peripherals acquired as a unit, priced greater than $1,750,000, on an if-sold basis.

---

b.   <u>User/Buyer Characteristics</u>

(1)   User

- **SEs:** IS department of the largest of the SEs and operating heads of specialized scientific/technical research organizations.

- **LEs:** IS provides services to appropriate administrative, operating, and technical units. All or major parts of the organization may be on-line. Only in rare instances   where leading-edge technical capabilities are a factor in job performance, such as universities, laboratories, aerospace engineering, and other computational intensive environments, is the end user directly concerned.

INPUT

(2)   Buyer

- IS but with approval and, frequently in LEs and always in SEs, heavy top management and even board-level involvement.

c.   <u>Applications/Usage</u>

- **Main Processor**--traditional mainframe role in LEs.

3	2	1
+	0	-

- **Large Network Hub**--communications, data management, and processing, but for very large networks.

3	4	5
+	+	+

- **Scientific/Technical Processing**--"number crunching" applications requirement in LEs and specialized SEs; e.g., atomic, medical, pharmaceutical, materials, and energy.

2	3	4
+	+	+

- **Large Data Base Host**--organizationwide data base engine for very large files.

5	4	3
+	+	+

- **Upward Growth of Distributed Applications**--some departmental applications will outgrow the network periphery.

1	2	3
0	+	+

- **"Strategic" Applications**--ambitious, new, and sweeping operational applications using new tools, networks, and data management resources will appear throughout the period.

3	4	5
+	+	+

INPUT

d.   Technological Impact

- **Parallel Architecture**--vast improvements in cost performance will open new processing-intense applications.

0	3	5
0	+	+

- **Superconductivity**--will improve power by an order of magnitude, opening up new horizons.

0	1	2
0	+	+

- **Other Improvements**--componetry, packaging, and imbedded functions will steadily improve cost effectiveness.

4	4	4
+	+	+

- **Standards**--imbedded functions and proprietary considerations will impede development of standards at the hardware level.

1	2	3
0	+	+

e.   Software Impact

- **Centralized RDBMs**--central RDBM systems, most notably DB2, will hold the corporate data center as hub for many large, new applications--increases resource requirement.

5	4	3
+	+	+

- **Distributed RDBMs**--will begin to offload data from the hub toward the end of the period.

1	3	5
0	-	-

- **Cooperative Processing**--networking, processing, and data management software transparency will promote distribution of function and workload throughout the organization.

1	3	5
0	-	-

INPUT

- **Outward Migration of Systems Functions, Increased Network Traffic, and Overhead**-- increases power demand at the network nodes (some become large systems).

1	3	5
0	+	+

f. <u>Market Size and Growth</u>

Category: Large Systems > $1,750,000	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	4550	5732	8%	6190	7220	8%	7798	11417	10%
SE (Small)	1140	1476	9%	1609	1912	9%	2084	3051	10%
SUM (Total)	5690	7208	8%	7799	9132	8%	9882	14468	10%
------Components------									
IBM	3500	4288	7%						
Honeywell	260	223	-5%						
DEC	400	518	9%						
UNISYS	350	429	7%						
Cray	370	608	18%						
Amdahl	460	612	10%						
NAS & Others (CDC, FP)	350	453	9%						

g. <u>Marketplace</u>

   (1) Marketplace Factors

- **PCMs**--plug-compatible mainframes will gain marketshare slightly, if at all, during the forecast period.

1	2	2
0	0	0

- **Offshore Supercomputers**--offshore machines, notably Japanese, with new architecture will impact high and late in the period.

	2	4
	-	-

- **Account Control**--companies, notably IBM, with vast applications, systems integration, and industry-oriented marketing will retain primary roles.

3	4	4
0	+	+

INPUT

(2)   Marketshare Gains/Losses

- IBM

2	3	4
+	+	+

- Amdahl/Fujitsu

2	1	1
+	+	-

- Cray

2	3	4
+	+	+

- Other U.S. Mainframe Manufacturers

1	2	3
-	-	-

- NAS/Hitachi

1	2	3
0	+	+

- DEC

1	2	3
0	+	+

INTERMEDIATE SYSTEMS (2)

- **Growth Drivers**

    - **Use as Applications-Specific "Engine"**   3+   4+   4+

    - **Network Node, Processing and DBMS Intermediary, Especially in LEs**   3+   3+   2+

    - **Open Architecture/Standards**   1-   20   4+

    - **Continued Performance Improvements**   3+   4+   4+

- **Growth Inhibitors**

    - **Slow Evolution of Standards and Complex User and System Interfaces**   5-   3-   10

    - **Skilled Manpower Shortages**   4-   4-   4-

2. INTERMEDIATE SYSTEMS ($150,000 to $1,750,000) **(2)**

---

a. <u>Definition</u>

- CPU, memory, and peripherals acquired as a unit, priced between $150,000 and $1,750,000, on an if-sold basis.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- In standard commercial applications the majority of users are clerical workers; some access by problem-solving professionals dedicated to specific functions and by executives for reports and decision support.

- In LEs and larger SEs, as time goes on throughout the forecast period, access will be increasingly extended to workers at all levels and to customers and suppliers via strategic network applications. (The same functionality will be achieved by SEs mainly through third-party service suppliers.)

(2) Buyer

- Many systems in this price range are purchased centrally in response to a committee representing user departments, especially in smaller enterprises. In LEs, many units are purchased independently by autonomous organizations. Increasingly, such purchases will be governed by standards.

- Operating department management and IS are all heavily involved. In SEs, top management and boards of directors often participate.

INPUT

c. Applications/Usage

- **Main Processor**--performs traditional mainframe function for SEs and separate organizational units of LEs ("push down" effect of improved price/performance).

4	2	2
+	0	0

- **Network Node**--acts as a processing, communications, and DBMS intermediary between echelons, geographically dispersed in LEs.*

    *However, much of this work will be done on smaller processors.

3	3	2
+	+	+

- **Application Processor**--engine for central or distributed DBMS, design, technical, factory floor, or other application-specific processing.

3	4	4
+	+	+

d. Technological Impact

- **New/Improved Architecture**--parallel processing, RISC, and other innovations will improve price/performance dramatically.

3	4	4
+	+	+

- **Denser Packaging**--size, environmental considerations, and costs will be reduced.

4	3	2
+	+	0

- **Improved Availability**--VLSI, packaging, and on-board maintenance features will profoundly improve system availability and maintainability.

4	4	3
+	+	+

INPUT

- **Slowly Evolving Standards**--technical, proprietary, and account control issues will slow adoption of uniform hardware standards.

1	2	3
-	0	+

- **Open Architecture**--will eventually promote greater use but at the expense of single-vendor solutions.

1	2	4
-	0	+

e. Software Impact

- **Centralized RDBMs**--central RDBM systems will provide the hub of new activity in larger SEs and organizational units of LEs.

4	5	3
+	+	+

- **Distributed RDBMs**--overall management and control of distributed data will remain an important function of "hub" systems.

2	3	3
+	+	+

- **Multiple OSs**--hosting multiple OSs, transparent data exchange, and interoperability will greatly ease problems for users, pending greater standardization.

4	5	2
+	+	+

- **"Strategic" Applications**--will be vastly facilitated by improved applications development tools, connectivity, and data base management software.

3	5	5
+	+	+

- **Technical Applications**--burgeoning AI, design simulation, CASE, and other technical applications software improvements will drive demand in LEs and specialized SEs.

3	4	4
+	+	+

INPUT

- **Standards**--programming, data format, user
interface, and communications standards will
solidify, promoting broader usage.

1	3	5
0	+	+

- **Limiters**--lack of standards, complex interfaces,
and programmer shortages will keep user risks
and costs high in the short run.

5	3	1
-	-	0

f.   Market Size and Growth

Category: Intermediate Systems > $150K-$1.75M	---Short term---			---Intermediate---			---Long term---		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	11050	13920	8%	15033	17861	9%	19469	28504	10%
SE (Small)	5945	7699	9%	8392	10340	11%	11477	18059	12%
SUM (Total)	16995	21619	8%	23425	28201	10%	30946	46563	11%
------Components------									
IBM	6850	8629	8%						
DEC	2800	3934	12%						
Honeywell	420	215	-20%						
UNISYS	2500	2978	6%						
NCR	710	870	7%						
CDC	300	347	5%						
NAS & Others (CDC, FP)	3415	4545	10%						

g.   Marketplace

   (1)   Marketplace Factors

- **PCMs**--domestic plug-compatible systems
in this price class will have little effect during
the forecast period.

	1	2
0	-	-

- **Offshore PCMs**--IBM and DEC strength combine
to hold offshore manufacturers largely at
bay in this price class.

	1	2
0	-	-

- **Account Control**--Companies, most notably IBM, with vast applications, systems integration, and industry-oriented marketing will retain primary roles.

3	4	4
0	+	+

- **DEC Inroads**--broad DEC VAX HW line and networking capability will continue to gain.

4	4	4
+	+	+

    (2)   Marketshare Gains/Losses

- IBM

3	4	4*
+	+	+

   *Minority opinion: IBM

1	2	3
-	-	-

- DEC

4	3	3
+	+	0

- Other U.S.

2	2	2
-	-	-

- Offshore Manufacturers

1	2	3
+	+	+

- Tandem

3	4	4
+	+	+

INPUT

SMALL SYSTEMS (3)

- **Growth Drivers**

  - **Applications-Specific Engine, Often with Industry W/Ss**   2   4   5
 +   +   +

  - **Department/Work Group Host and Network Node**   2   3   4
 +   +   +

  - **Main Processor for SEs**   3   3   3
 +   +   +

  - **Evolving Connectivity, Network Nodes**   2   3   5
 +   +   +

  - **Continued Price/Performance Improvements**   2   3   4
 +   +   +

- **Growth Inhibitors**

  - **PC LAN "Explosion"**   2   4/3   2
 -    -   -

  - **Micro Encroachment**   2   4   2
 -    -   -

  - **Programmer Shortage**   3   3   3
 -    -   -

3. SMALL SYSTEMS ($15,000 to $150,000) **(3)**

---

a. <u>Definition</u>

- CPU, memory, and peripherals acquired as a unit, priced between $15,000 and $150,000, on an if-sold basis.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Since used mainly as departmental systems and cluster controllers, users will comprise a mix of non-professional and professional workers. Minicomputer-based distributed data base applications will erase the concept of the traditional "departmental system," tending toward functional, rather than organizational, specialization. Use of multiuser, multitasking systems will increase at the "work group" level throughout the forecast period, especially in LEs.

- More systems will be sold with application-specific peripherals, leading to increased computer use by traditional workers. High-performance workstations will be linked through networks controlled by small systems. In many SEs, these systems will play the role of mainframe.

(2) Buyer

- In LEs, many units will be purchased at departmental level, but increasingly, such purchases will be governed by organizationwide standards. Systems >$25,000 will continue to be bought by IS through central purchasing. CPUs selling for >$100,000 frequently will have been evaluated and recommended by a committee. In LEs, an increasing number of specialized systems will be purchased from VARs, system integrators, and software houses.

INPUT

- In SEs, many small systems will be purchased on a turnkey basis (combining system and application software), and most purchases will require committee and corporate approval.

c. Applications/Usage

- **Main Processor**--performs traditional mainframe functions for SEs and separate organizational units of LEs.

3	3	3
+	+	+

- **Work Group Host**--multiuser shared application and shared data systems will proliferate at departmental and work group levels.

2	3	4
+	+	+

- **Application-Specific Workstations Host**-- workstations optimized for various commercial as well as manufacturing and engineering functions will appear. Many will be hosted by small systems.

2	3	3
+	+	+

- **Application-Specific Processors**--machines optimized for data base, AI, graphics, engineering, commercial, and other types of processing will proliferate in this price class.

2	4	5
+	+	+

- **Multiple Systems per Department**--foregoing connotes growing number of systems per department in LEs and per company in SEs.

2	3	5
+	+	+

- **PC LANs**--countervailing influence is long-awaited PC "explosion" in companies where PCs are well entrenched.

2	4/3	2*
-	-	-

*Unclear, considerable controversy over software availability and cost of connectivity.

- **Improved Micro Technology**--larger capacity and improved price/performance.

2	4	2
-	-	-

d.   Technological Impact

- **New/Improved Architecture**--introduction and downward migration will improve price/performance.

2	3	4
+	+	+

- **Denser Packaging**--size, environmental considerations, and costs will be reduced.

3	3	4
+	+	+

- **Improved Availability**--VLSI, packaging, and on-board maintenance features will improve system availability and maintainability.

4	4	3
+	+	+

- **Stabilization of PCs**--decrease in rate of new microprocessor introductions will reduce erosion of small systems.

1	2	2*
0	+	+

*Strong minority opinion that PC technology will not stabilize during this period.

INPUT

- **Growth in Applications-Specific Processors**--
  independently optimized, yet communications
  and data-compatible systems will proliferate,
  especially late in the forecast period and in
  LEs.

2	3	5
+	+	+

- **New Technology**--graphics, image processing,
  voice, electronic filing, and other new devices will
  be available.

3	4	4
+	+	+

  e.   Software Impact

- **Improved Applications Development**--tools,
  CASE, and application generators make creation,
  modification, and maintenance of applications
  increasingly easy and effective. True for
  LEs and SEs as well.

2	4	5
+	+	+

- **Application-Specific Software**--will provide
  automation for wider range of professional,
  clerical, and blue-collar tasks.

2	3	4*
+	+	+

  *Minority opinions: during later timeframe,
  specificity will be in assembly of modules,
  not packages, as shown.

- **Connectivity**--evolving standards and
  improved software will promote multi-
  level processing networks.

2	3	5
+	+	+

- **Distributed RDBMS**--compatible work
  group RDBMs will distribute data without
  sacrificing interdepartmental access.

1	3	4
+	+	+

INPUT

- **UNIX Compatibility Problems Remain**--
  vendors continue to build in "hooks,"
  limiting portability.

2	3	3
-	-	-

- **Programmer Shortage**--qualified systems
  and applications programmers will remain in
  short supply.

3	3	3
-	-	-

f. <u>Market Size and Growth</u>

Category: Small Systems > $15K- $150K	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	2285	3041	10%	3345	4348	14%	4956	7524	11%
SE (Small)	1865	2482	10%	2731	3425	12%	3836	6479	14%
SUM (Total)	4150	5524	10%	6076	7773	13%	8793	14003	12%
------Components------									
IBM	1100	1545	12%						
DEC	400	593	14%						
HP	750	998	10%						
NCR	300	378	8%						
UNISYS	150	189	8%						
Wang	400	518	9%						
Others	1050	1286	7%						

g. <u>Marketplace</u>

(1) Marketplace Factors

- **General Purpose Suppliers**--companies will
  broaden product line and link workstations
  into small systems later in the period.

2	3	3
+	+	+

- **"Bunch" Suppliers**--synergies and new
  products will help keep customers locked
  in.

2	2	2
+	+	+

INPUT

- **Account Control**--vendors' improved relationships with, and dependence on, third parties will indirectly strengthen account control.

2	2	3
0	+	+

- **Marketing**--will increasingly emphasize large users, system integration, new peripherals, new distribution channels, and support.

3	4	5
0	+	+

    (2)   Marketshare Gains/Losses

- IBM (s/3X; low end 43XX; PC/AT/RT)

2	3	3
+	+	+

- Wang

3	2	2
-	-	-

- New Entrants

2	2	3
0	0	+

- DEC

2	3	2
+	+	0

- Other General Purpose System Vendors

3	2	2
+	0	-

INPUT

PERSONAL COMPUTERS (2)

- Growth Drivers

  - Occupation-Specific Application

    3 4 4
    + + +

  - Departmental/Work Group Clusters

    2 2 3
    + + +

  - Main Processor in SEs

    2 3 4
    + + +

  - Optical Storage

    1 3 4
    0 + +

  - Continued Price/Performance
    Improvements

    4 3 2
    + + +

  - New Graphic Techniques

    3 5 5
    + + +

- Growth Inhibitors

  - Multiple, Complex Software Interface

    3 2 1
    - - 0

  - Connectivity Weak and Unstandardized

    4 3 2
    - - -

  - Distribution Channel Disarray

    4 3 3
    - 0 +

  - Invisibility of Added-Value, Lack of
    Pricing "Umbrella"

    5 5 3
    - - 0

4. PERSONAL COMPUTERS **(2)**

---

a. <u>Definition</u>

- Personal computers (also known as microcomputers) are 8-, 16-, or 32-bit programmable information systems priced under $15,000.

---

b. <u>User/Buyer Characteristics</u>

    (1)   User

- Users are typically professionals whose functional responsibilities include the collection, analysis, and dissemination of data/information/knowledge. Users may reside at any level of the organization, but typically engage in activities related only to one sphere--individual, work unit, or institution.

- Usage of personal computers as a business tool is a relatively new skill for most workers. Few users have yet gained a sufficient level of expertise for organizations to realize significant productivity gains through use of personal computers.

    (2)   Buyer

- Personal computer buyers in LEs range from the individual user to support personnel from IS. Purchasing conflicts have arisen between buyers interested in pursuing their own individual needs and corporate IS attempting to set standards and gain greater control.

INPUT

c. <u>Applications/Usage</u>

- **Personal Productivity Applications**-- applications include preparation of documents using word/graphics processors, preparation of analyses using spreadsheets, and construction of personal files.

4	3	3
+	+	+

- **Occupation-Specific Applications**--using data/ information from central or department system to perform group work.

3	4	4
+	+	+

- **Work Group and Department Applications**-- using shared information, processing, and software to perform group work.

2	2	3
+	+	+

- **Small Enterprises**--multiuser PCs emerge as main processor for small companies performing mainline applications (via LAN or shared logic).

2	3	4
+	+	+

d. <u>Technological Impact</u>

- **Power at Hand**--increasingly powerful computers available with smaller footprint for desk, travel, and home.

3	3	3
+	+	+

- **Price/Performance Improvements**--will continue to cross thresholds and enable movement of applications to point-of-use.

4	3	2
+	+	+

INPUT

- **Optical Storage**--e.g., CD ROM, personalizes information accessibility the same way the PC personalized processing.

1	3	4
0	+	+

- **New Graphics Technology**--hardware/software breakthroughs lead into new graphics imaging applications of which desktop publishing is the first.

3	5	5
+	+	+

e. Software Impact

- **Ease of Use**--a barrier to use, particularly for multilevel applications; icons, windows, AI attack and solve the problem by mid-1990s.

3	2	1
-	-	0

- **Micro-Mainframe Connectivity**--encompasses communications, data base, common user interface, and other aspects. Applications design needs to include the concept; absence slows down implementation.

1	2	3
+	+	+

- **New Operating Environments**--multiuser, multitasking operating systems will open many new doors.

2	3	3
-	+	+

- **Improved Packaged Applications**--steadily improved integration, functionality, efficiency, documentation, and support make PC-based applications packages more attractive.

2	3	4
+	+	+

INPUT

f. <u>Market Size and Growth</u>

Category: Personal Computers < $15K	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
	---Short term---			---Intermediate---			----Long term----		
LE (Large)	5000	6475	9%	7058	8386	9%	9140	12902	9%
SE (Small)	5000	6475	9%	7058	8540	10%	9394	14261	11%
SUM (Total)	10000	12950	9%	14116	16926	10%	18534	27163	10%

------Components------

IBM	3200	4259	10%
Apple	1400	1764	8%
HP	450	536	6%
NCR	350	382	3%
Wang	200	252	8%
DEC	250	333	10%
Others (Compaq, Clones, etc.)	4150	5524	10%

g. <u>Marketplace</u>

    (1)   Marketplace Factors

- **Buying Process**--in LEs, standards set for brands centrally; purchases of approved list locally. Continued reevaluation as new generations emerge.

3	4	4
-	+	+

- **Japanese/Pacific RIM**--clones are important whenever the market stabilizes.

5	4	3
-	+	+

- **Distribution Disarray**--use of distribution retail chains has forced commodity-type pricing. Distribution channels over capacity versus demand. New channels emerging.

4	3	3
-	0	+

INPUT

- **Integration at Small Level**--retailers recognizing profit in "value-added" software, professional services, add-ons, suppliers, etc., will move hardware as part of service.

3	4	4
+	+	+

- **Pricing**--price competition will be fierce; no stable "umbrella."

5	5	3
-	-	0

    (2)   Marketshare Gains/Losses

- IBM

1	2	2
0	+	+

- Apple

3	1	1
+	0	0

- Clones

2	1	2
+	0	-

- Others

3	2	2
-	-	-

INPUT

DISPLAYS (3)

- **Growth Drivers**

  - **Improved Resolution and Supporting Graphics Software**

1	2	3
0	+	+

  - **"Strategic" Applications Growth**

3	3	2
+	+	+

  - **New Multiterminal Mini and PC Applications (Work Group in LEs and Enterprise in SEs)**

1	2	3
+	+	+

- **Growth Inhibitors**

  - **Displacement by Industry Workstations**

2	3	4
-	-	-

  - **Inroads of PCs and Linkage**

3	4	4
-	-	-

  - **LANs over WANs**

3	5	5
-	-	-

  - **Price Erosion**

2	3	3
-	-	-

5.   DISPLAYS **(3)**

---

a.   <u>Definition</u>

- Displays are input/output devices attached to dumb, extended-function, or
  user-programmable computer intelligence, usually remote. The so-called "dumb"
  terminals may be single-station or multistation shared logic synchronous or
  so-called "glass teletype" ASCII asynchronous.

- Display terminals are distinguished from user-programmable personal
  computers used as terminals and from limited-function devices designed
  specifically for applications as discussed under the category of Industry
  Workstations.

b.   <u>User/Buyer Characteristics</u>

(1)   User

- In large organizations, the terminal user is not the buyer but an individual with a
  need for access to remote computing support. The user may be technologically
  sophisticated (e.g., a systems programmer) or have limited computing skills (e.g.,
  clerk, controller, chief executive). In both cases, user terminal requirements
  revolve around their assigned applications. So, "ease of use" for the systems
  programmer has a very different meaning than it does for the controller.

(2)   Buyer

- The buyer is most often housed in the IS department and is charged with
  providing end users with devices from which they can access computing
  services. Whether those services are provided in-house or by an outside
  contractor, the buyer's primary concerns are compatibility, functionality, and ease
  of use.

INPUT

c. <u>Applications/Usage</u>

- **On-Line Applications Growth**--many
new "strategic" applications require main-
frame access.

3	3	2
+	+	+

- **Shift to "Knowledge Work" Cuts Both
Ways**--more access to corporate and
outside data needed, but more local processing
intelligence required.

3	4	5
0	0	0

- **Interconnectivity**--tendency for communi-
cations to spread around concentric work group,
department, and interdepartmental rings
lessens need for traditional terminal-mainframe
topology.

2	3	5
-	-	-

d. <u>Technological Impact</u>

- **Industry/Application-Specific Workstations**--
devices designed for specific applications
or industry functions proliferate.

2	3	3
-	-	-

- **Miniaturization**--smaller devices permit
wider usage by travelers, field workers, etc.
Cellular technology will also boost usage.

2	2	3
+	+	+

- **Emulation Boards for PC**--these PC
boards allow direct substitution of PCs
for 3270s and other terminals.

2	4	4
0	-	-

INPUT

- **LAN Gateway Emulation**--These gateways link PCs, emulating virtually any WAN protocol.

2	3	4
0	-	-

- **Improved Display Resolution**--supports prices and increases applicability for graphics.

1	2	3
0	+	+

e. <u>Software Impact</u>

- **Improved Networking and On-Line Applications Software**--efficiency and ease of development of large scale, on-line applications will continue to improve.

3	3	3
+	+	+

- **Improved Micro-Mainframe Links**--improvements similar to the above will also make it easier for PCs to substitute as terminals.

2	3	4
-	-	-

- **Multiterminal PC Applications**--continued development of departmental and standalone multiuser, multiterminal applications for minis, micros, and PCs stimulates display market.

1	2	3
+	+	+

f. <u>Market Size and Growth</u>

Category: Displays	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	2954	3518	6%	3729	4112	5%	4317	5248	5%
SE (Small)	1266	1466	5%	1539	1664	4%	1731	2025	4%
SUM (Total)	4220	4984	6%	5268	5776	5%	6048	7273	5%
------Components------									
ASCII/ANSI	600	821	11%						
IBM-compatible	1200	1554	9%						
DEC-compatible	350	441	8%						
Graphic	220	419	24%						
Intelligent	1600	2629	18%						
Others	250	380	15%						

INPUT

g. <u>Marketplace</u>

(1) Marketplace Factors

- **Price of PCs**--as prices fall on programmable devices, the smaller differential negates interest in displays.

3	4	4
-	-	-

- **LANs Predominate Over WANs**--connectivity at the department and work group level reduces the need for terminals on-line to central systems.

3	5	5
-	-	-

- **Price Erosion**--prices continue to fall under pressure from demand shift and offshore competition.

2	3	3
-	-	-

(2) Marketshare Gains/Losses

- IBM

2	2	2
+	+	+

- Other Computer Manufacturers*

2	2	2
0	0	0

*INPUT sees no discernible trends to upset marketshares in this arena. DEC gains will probably be offset by losses of other computer manufacturers. IBM share vis-a-vis either will probably hold.

INPUT

- Independents

1	2	3
-	-	-

INDUSTRY WORKSTATIONS (3)

- Growth Drivers

  - Thrust From Need for Improved   4   3   3
    Productivity   +   +   +

  - Dramatic Human Interface Improvement   2   3   4
                                            +   +   +

  - Increasing Specialization at all Levels   2   3   4
                                            +   +   +

- Growth Inhibitors

  - Some LEs May Develop and Assemble   1   2   3
    their Own Devices   0   -   -

  - Software and Service Offerings will   2   0   0
    Take Time to Develop   -   0   0

6. INDUSTRY WORKSTATIONS **(3)**

---

a. <u>Definition</u>

- Industry workstations include "limited function" input/output devices originally developed for such applications as CAD-CAM, airline ticketing, point-of-sale, factory data collection, and the like.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Users in large organizations influence the purchase decision for workstations connected to internal computers since their efficiency with the device may be the ultimate test of productivity gains. Users focus on functionality--does the workstation help the user perform the assigned tasks? In other cases, operators may be only minimally involved in the decision (e.g., point-of-sale workstations) where the purchasing criteria are focused on functional departments likely to gain productivity or control.

(2) Buyer

- Buyers may be individuals but are more likely to be department managers with either vertical (e.g., computer-aided engineering) or horizontal (e.g., accounting) responsibilities. Issues of cost rank with functionality in the purchasing decision. In most enterprises, regardless of size, IS, operating, and, in many cases, top management, will play a role in the fundamental decision since industry workstations usually impact the way the business is done.

c. Applications/Usage

- **Productivity Improvement**--use of workstations in all professional and operational applications driven by productivity improvements.

4	3	3
+	+	+

- **Customer Service Improvement**-- workstations at point of customer contact improve customer service and business results.

3	4	4
+	+	+

- **Workstations Guide Worker and Customer Functions**--speed and accuracy of transacting are improved, training and familiarization requirement is reduced.

2	3	4
+	+	+

- **Increased Specialization of Application to Individual Requirements**--narrow functions are better served with specialized workstations.

2	3	4
+	+	+

d. Technological Impact

- **Better Cost/Performance**--will expand internal use and direct services to customers and suppliers.

3	3	3
+	+	+

- **Improved Capabilities**--use of smart cards, support data in CD ROM, miniaturization (e.g., handheld workstations), and voice recognition/ response will expand penetration.

2	3	4
+	+	+

- **Expanded Networking Support**--will link workstations to more operational and support systems and to external data.

2	3	4
+	+	+

INPUT

- **New Graphics Technology**--hardware/software
  breakthroughs greatly enhance functionality
  in many applications.

2	3	3
+	+	+

e. <u>Software Impact</u>

- **Smarter Workstations**--AI software will help to
  steer workers or customers and enable more
  accurate and useful data to be collected.

2	3	4
+	+	+

- **Software at the Workstation**--code generation
  and other software development techniques will
  allow precise tailoring to the application.

2	3	4
+	+	+

- **Multitasking, Windowing, Multiuser,
  Communicating OSs**--new tools enhance
  usefulness to specialist users (e.g., engineers,
  financial analysts, planners, etc.).

2	3	3
+	+	+

- **AI/Expert Systems**--will help tune workstations
  to individual function, enhancing productivity
  and usefulness.

2	3	4
+	+	+

INPUT

f. <u>Market Size and Growth</u>

Category: Industry Workstations	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	2285	3041	10%	3345	4122	11%	4575	7199	12%
SE (Small)	760	1068	12%	1196	1582	15%	1819	3181	15%
SUM (Total)	3045	4109	11%	4541	5703	12%	6394	10380	13%
----Components----									
IBM	590	785	10%						
Intergraph	360	506	12%						
Computervision	280	393	12%						
CALMA	120	155	9%						
Applicon	100	133	10%						
Daisy	55	64	5%						
Wang	300	378	8%						
NBI	350	429	7%						
CPT	240	278	5%						
Other POS	400	532	10%						
Other ATM, etc.	250	351	12%						

g. <u>Marketplace</u>

    (1)   Marketplace Factors

- **Competition Segmented**--many vendors
  concentrate on engineering, ATM-POS,
  treasury, office, or other areas and do not tend
  to compete in multiple areas, gradually giving
  way to, or being absorbed by, broader-gauge
  players.

3	2	1
+	+	0

- **Hardware and Software Vendors will
  Intensify Competition**--since workstations
  lead to more services and expanded work, hardware
  and software vendors will expand their presence.
  Many will integrate workstations with service
  offerings.

2	3	3
+	+	+

INPUT

- **User-Developed Workstations**--large
  users will attempt to improve productivity
  and in-house advantages with a differentiated
  unit.

1	2	3
0	-	-

- **Offshore Vendors**--will invade market to help
  sell other gear, but lack of software will
  inhibit their success.

1	2	2
0	0	0

- **DEC Inroads**--DEC will use new workstations
  to leverage sales.

0	1	2
0	+	+

    (2)   Marketshare Gains/Losses

- IBM

2	3	3
+	+	+

- DEC

0	1	2
0	+	+

- Other Independents

4	3	2
+	+	+

- Office Vendors (NBI, CPT, Xerox)

3	2	1
-	-	-

INPUT

TAPE STORAGE (3)

- Growth Drivers

  - **Expanded Need for Image Storage**   2+   2+   3+

  - **Expanded Need for EDI Backup**   2+   4+   2+

  - **New Tape Technologies**   2+   2+   10

- Growth Inhibitors

  - **DASD Improvements**   2-   2-   1-

  - **Applications Demand More Immediate Access to Data**   3-   4-   5-

  - **Competition for Archiving from Optical Storage**   1-   2-   3-

7.   TAPE STORAGE **(3)**

a.   <u>Definition</u>

- This category includes all magnetic tape and cartridge storage devices that have single or multiple drivers within a single unit as the support for recording media. These range from high-capacity cartridge (using multiple drivers) and medium-capacity reel-to-reel units to small-capacity bit streamer cartridges.

b.   <u>User/Buyer Characteristics</u>

(1)   User

- There are two main groups of users: the capacity upgrader who has been a user for many years, and the user who is price-driven within a given capacity range. Both demand very high reliability and serviceability, factors which can erase any capacity, performance, or price advantage if they fall below market standards.

- The principal advantage of the standard reel-to-reel tape unit is the user's familiarity with it (many of today's DP managers have used magnetic tape since they first began in data processing). The advantages of both the high-end and low-end cartridges are the reasonable price/performance ratio, the convenience of handling, and the reliability.

- Since the introduction of the IBM 3480 the tape drive market has seen a renaissance, but tape storage is the prime candidate for replacement by optical storage, both CD-ROM (write once) and the read/write optical alternatives that are now emerging from the laboratory.

- In almost all cases, and in enterprises of all sizes, except for low-end tape backup devices on PCs, the buyer is the IS department or the using functional department with IS approval and/or involvement.

INPUT

(2) Buyer

c. Applications/Usage

- **Archival/Historical Files**--storage of reference
  data for infrequent access.

1	1	1
+	+	+

- **Very Large Data Files**--on-line storate of files
  exceeding the normal capacity of magnetic
  disk files (e.g., >500 MB).

2	2	1
+	+	+

- **Backup/Checkpoint**--storage of "freeze-frame"
  pictures of data and file status for reference
  and comparison at later date or for restart
  in case of failure.

2	2	2
+	+	+

- **Text, Graphics, Image Storage**--support for
  very large files such as reference manuals,
  graphic and text libraries, etc.

2	2	3
+	+	+

- **Scientific/Engineering**--the capture of batch-
  oriented, voluminous data streams
  (e.g., Voyager probe, bit streamer backup on
  PC, etc.).

2	2	2
+	+	+

- **Internal and External EDI (Electroni-
  fication)**--requires extensive backup.

2	4	2
+	+	+

- **Backup for Distributed Systems.**

2	3	2
+	+	+

INPUT

d. <u>Technological Impact</u>

- **DASD Price/Performance Improvements.**

2	2	1
-	-	-

- **Optical Storage**--transfer of archival storage and status data to CD ROM and others.

1	2	3
-	-	-

- **Cartridge Tape Price/Performance Improvements**--makes tape a more attractive medium.

1	1	1
+	+	+

- **New Tape Technologies**--will help keep tape competitive with optical storage devices.

2	2	1
+	+	0

e. <u>Software Impact</u>

- **Improved IRM Systems**--more optimal information resource management may serve to promote greater use of tape by offloading least-used data from DASD.

1	2	2
+	+	+

- **New Applications Demand DASD**--newer, stratetgic, on-line systems eschew tape storage.

3	4	5
-	-	-

INPUT

Category: Tape Storage	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1695	2019	6%	2140	2315	4%	2407	2816	4%
SE (Small)	565	712	8%	769	897	8%	968	1317	8%
SUM (Total)	2260	2731	7%	2909	3211	5%	3375	4133	5%
------Components------									
Slow speed (25ips)	200	146	-10%						
Med. speed (50-125ips)	380	326	-5%						
High speed (>125ips)	450	551	7%						
Cartridge	680	905	10%						
Bit-streamer	200	346	20%						
Other (special purpose)	350	405	5%						

g.   Marketplace

    (1)   Marketplace Factors

- **PCMs**--domestic suppliers will remain a mild competitive force (STC, Memorex).

1	1	1
+	+	+

- **Offshore PCMs**--will influence the high end of the tape storage market in terms of price and performance (e.g., Hitachi, Fujitsu).

2	2	2
+	+	+

- **System Manufacturers**--will supply the dominant share of product.

2	2	2
+	+	+

- **Startups**--negligible impact except in the IBM 3480 arena (e.g., Aspen Peripherals).

1	1	1
0	0	0

INPUT

(2)   Marketshare Gains/Losses

- IBM

2	1	1
+	+	+

- Memorex

1	1	1
-	-	-

- STC

1	2	2
-	-	-

- Other U.S.

1	1	1
-	-	-

- Offshore Manufacturers (Fujitsu, Hitachi)

2	2	3
+	+	+

INPUT

DASD STORAGE (3)

- **Growth Drivers**

  - **More "Strategic" On-Line Applications** 3 4 5
    + + +

  - **Distributed IRM** 3 4 4
    + + +

  - **Growth in RDBMS** 2 3 4
    + + +

  - **Graphics, Image, and Document Storage Expansion** 2 3 4
    + + +

- **Growth Inhibitors**

  - **Price Erosion** 3 3 4
    - - -

  - **Slow Implementation of New Applications** 3 2 1
    - - -

8. DASD STORAGE **(3)**

---

a. <u>Definition</u>

- This category includes all magnetic and optical storage devices that have single or multiple platters as the support for recording media. These range from high capacity (500MB to 5GB and up per unit which use 8-14" platters) and medium capacity (100MB to 500MB which use 5.25-8" platters) to small capacity (200K to 100MB which use 3-5.25" platters).

---

b. <u>User/Buyer Characteristics</u>

- The user and buyer tend to be synonymous: the IS department in enterprises of significant size and, to a lesser extent, end users at the desktop and department level.

- There are two main groups of users: the first is capacity and performance driven, the second is price driven within a given capacity range. Both demand very high reliability and serviceability, factors which can erase any capacity, performance, or price advantage if they fall below market standards.

- There has been a downturn in DASD purchasing due to: 1) a "digestive" pause by users looking to consolidate their existing systems before moving ahead with the next phase of automation and storage capacity expansion; 2) technological uncertainty due to the rapid pace of new product introductions; and 3) a shift to broader distribution of data and information out from the corporate facility to the divisional facilities and the professional individual.

- Part of the purchasing power is being delegated from the former centralized corporate IS manager and that trend will continue, but usually under IS standards and guidelines.

INPUT

c. Applications/Usage

- **Archival/Historical Files**--with the reduction in acceptable response rates and the increase in rate of updating, part of these files are coming onto dynamic storage, including DASD. Typical value: >1 month old.

2	2	3
+	+	+

- **Transitory Files**--act as intermediate files for storing current data pending update or permanent archiving. Typical value: >1 day <1 month.

2	2	3
+	+	+

- **Temporary Files**--support ongoing realtime transactions and corresponding mid-phase results and data. Typical value: <1 day old.

3	4	5
+	+	+

- **Distributed Data Bases**--support departmental, work group, and LAN-connected users with general purpose data/information storage.

3	4	4
+	+	+

- **Text Storage**--supports the creation, storage, and transmittal of text and document-oriented files, inter- and intra-enterprise.

2	2	3
+	+	+

- **Graphics Storage**--supports the creation, storage, and transmittal of image-based files, inter- and intra-enterprise.

2	3	4
+	+	+

INPUT

- **Network Store and Foreward**--supports the error-free transmittal of data, text, voice, and image in realtime environments.

2	2	3
+	+	+

- **Engineering/Scientific**--the realtime capture of sensor data and interrupt-driven phenomena.

2	3	3
+	+	+

d.   <u>Technological Impact</u>

- **Conventional Technology Improvements**--downsizing platters, increasing recording densities and transfer rates.

2	2	1
+	+	+

- **Optical Storage (e.g., CD-ROM)**--gradual transfer of archival storage to 12" and 12 cm optical drives.

1	2	3
+	+	+

- **"RAM-inboarding"**--the incorporation of small (<10 MB) storage on CPU boards in PCs, terminals, etc.

1	1	1
-	-	-

e.   <u>Software Impact</u>

- **Distributed DBMS**--will facilitate the sale of DASD to divisional/departmental processing centers.

2	3	4
+	+	+

- **Artificial Intelligence**--requires large storage facilities for AI applications processing.

1	2	3
+	+	+

INPUT

- **Relational DBMS**--accelerating use promotes the creation of new data bases rather than replacements.

2	3	4
+	+	+

f.   Market Size and Growth

Category: DASD/Storage	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	3070	3761	7%	4024	4781	9%	5211	7356	9%
SE (Small)	1030	1334	9%	1454	1791	11%	1988	3019	11%
SUM (Total)	4100	5095	8%	5478	6572	10%	7200	10375	10%
------Components------									
IBM	2280	2793	7%						
DEC	390	451	5%						
CDC	350	492	12%						
Seagate	290	430	14%						
StorageTek	150	164	3%						
Memorex	120	143	6%						
Others	520	692	10%						

g.   Marketplace

   (1)   Marketplace Factors

- **PCMs**--domestic suppliers will continue to operate in lower tier of the market on a price basis rather than performance leader basis.

1	1	1
+	+	+

- **Offshore PCMs**--will have influence in the lower end of the market, particularly smaller floppy disks and optical storage devices.

1	2	2
+	+	+

INPUT

- **System Manufacturers**--will supply the dominant share of market direction, growth, and innovation, except for optical storage.

2	2	2
+	+	+

- **Startups**--will supply the dominant share of innovation for optical storage.

1	2	3
0	+	+

- **Price Erosion**--overall impact will include continued price erosions, especially low end in the short and intermediate term, high end as well later.

3	3	4
-	-	-

    (2)   Marketshare Gains/Losses

- IBM

1	2	3
+	+	+

- CDC

2	2	2
-	-	-

- Other U.S.

2	2	2
+	0	-

- Offshore Manufacturers

1	2	3
+	+	+

INPUT

PRINTERS (3)

- **Growth Drivers**

    - **Integrated Documents**   4   5   5
      (Text, Graphics, Image)   +   +   +

    - **Improved Technologies: Color** 3   4   4
      Resolution, Printing Methods, +   +   +
      Paper Handling

    - **Standard Page/Document**   5   5   3
      Description Languages   +   +   +

- **Growth Inhibitors**

    - **EDI (Internal and External)**   2   4   5
      Replaces Paper   -   -   -

    - **Standards Slow to Evolve**   2   3   3
                                        -   0   +

    - **Price Erosion**   3   4   5
                                        -   -   -

    - **Maintenance Costs Restrain Impact** 3   4   5
      Printer Sales   -   -   -

9. PRINTERS **(3)**

---

a. <u>Definition</u>

- Hard copy output devices (not including plotters) associated with computer systems. Includes dot-matrix, daisywheel, impact, non-impact, inkjet, and thermal devices.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Low-duty cycle users on PC or micro-based platforms procure directly from retail channel; i.e., Businessland, Computerland, dealers, distributors. Price range is typically less than $10,000. These users may go through a central procurement to obtain most-favored customer pricing, especially in the larger enterprises.

- Medium-duty cycle users procure through corporate purchasing and connect to mini or departmental system. Needs approval of IS director but has purchase authority. Price is typically <$50,000.

- Heavy-duty cycle user procures within the IS budget using the corporate decision process in place for that organization.

- Over the planning horizon the price/performance of the printers will be improving, thereby providing higher duty cycle at a lower price. The same scenario will apply as described above.

INPUT

(2)   Buyer

- Most printers will be purchased through the general procurement process of the specific organization and be charged to the appropriate user budget. Users will be directed to particular vendors to derive the best price, but purchase approval will not be required for low-duty cycle printers. Later on in the forecast period the same will be true of medium-duty cycle printers. Heavy-duty cycle printers are integral to the corporate IS group and will require central purchasing approval and senior management approval if strategic implications and/or capital involved in the procurement are significant.

c.   Applications/Usage

- **Traditional Usage**--hard-copy output for general computer applications; e.g., accounting, reporting, and documentation.

4	3	2
+	+	0

- **Integrated Documents**--documents include text, graphics, and image data.

4	5	5
+	+	+

- **Shared/Networked Printer**--communicating printers and high-duty cycle printers provide effective output distribution.

2	3	4
0	+	+

- **Advanced Applications**--compound documents (text, graphics, voice); voice-annotated output.

1	2	3
0	0	+

INPUT

- **Internal/External EDI (Electronification)***-- replaces paper.

2	4	5
-	-	-

  *Minority Opinion: GK thinks additional paper documents will actually increase in number.

- **Direct Mail Marketing**--a large consumer of print cycles.

3	2	1
+	+	+

  d. <u>Technological Impact</u>

- **Resolution Increases**--to provide more quality 300 dpi -> 400 -> 1000; 24-wire -> 48-wire.

3	4	4
+	+	+

- **Color**--non-impact color introduced.

4	5	5
+	+	+

- **Paper Handling**--yields letter form, 11x17 continuous form, and finishing (i.e., stapling, duplexing, book binding).

3	4	4
+	+	+

- **Raster Image Processors (RIP)**--upgraded memory, faster micros, more bandwidth for communications.

4	4	4
+	+	+

- **Traditional Devices Retired**--electro/ mechanical line printers lack flexibility and whither.

3	2	1
0	-	-

INPUT

- **Other Printing Technologies**--inkjet,
  magnetography, thermal, LED, LCD,
  ION disposition improve in price/performance/
  quality.

3	4	4
+	+	+

e. Software Impact

- **Page/Document Description Languages**--
  applications vendors use "standard" languages
  to drive full functionality of printer.

5	5	3
+	+	+

- **Enhanced Printer Data Systems**--document
  interchange formats included.

3	3	3
0	+	+

- **Printer Support Architecture**--analagous
  to AFP to provide printer environment
  in support of remote printing.

3	3	4
0	+	+

- **Color Output**--drivers need to be written.

3	3	3
+	+	+

- **Increased Printer Intelligence**--applications
  internal to printer subsystem for enhanced
  price/performance.

2	3	3
0	+	+

- **Interfacing Enhancements**--support for
  networking; i.e., Ethernet, SNA, ISO.

3	3	3
+	+	+

- **Standards Continue to Evolve**.

2	3	3
-	0	+

INPUT

f. <u>Market Size and Growth</u>

Category: Printers

	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
	---Short term---			---Intermediate---			----Long term----		
LE (Large)	3400	4283	8%	4626	5296	7%	5667	7154	6%
SE (Small)	2300	3061	10%	3367	4075	10%	4482	6098	8%
SUM (Total)	5700	7344	9%	7993	9371	8%	10149	13252	7%

-----Components-----

Impact Matrix	2300	3974	20%
Solid Font			
(belt, drum, daisy)	1700	2142	8%
Thermal	300	347	5%
Page & Laser	650	1180	22%
Ink-Jet	350	575	18%
Other (electrostatic, etc.)	400	463	5%

g. <u>Marketplace</u>

    (1)   Marketplace Factors

- **Price/Performance/Functionality**--prices will drop, performance and functionality improve, squeezing margins and making market entry difficult.

3	4	5
-	-	-

- **Traditional Impact Printers Decline**--the usefulness of impact printers is in serious jeopardy and could possibly vanish as parts/maintenance become serious problems.

3	4	5
-	-	-

- **Japan, Inc. Shakeout**--the myriad of Japanese suppliers contract and Canon and Ricoh emerge as leaders.

3	4	4
-	0	+

INPUT

- **Strategic Partnering**--large manufacturers, system houses, and marking engine manufacturing form alliances; e.g., HP/Canon/Imagen, IBM/Ricoh/Adobe, etc...

3	4	4
+	+	+

- **Family Printer Strategy**--compatible low-end, mid- and high-duty cycle printer strategy evolves.

3	4	4
+	+	+

    (2)   Marketshare Gains/Losses

- IBM

1	2	3
-	0	+

- Other Printer Manufacturers

2	2	1
+	0	-

TELECOMMUNICATIONS EQUIPMENT (3)

- Growth Drivers

    - Massive Growth in Store for On-Line   4   5   5
      Systems   +   +   +

    - Increasing Availability of Digital   3   4   5
      Transmission Services   +   +   +

    - (Slowly) Reducing Common Carrier   2   3   5
      Communications Charges   +   +   +

    - Software (e.g., AI) Reduces Interface   2   3   4
      and Transmission Complexity   0   +   +

- Growth Inhibitors

    - Price Erosion   4   5   3
                                               -    -   0

    - General Purpose Minis and Micros   2   3   4
      Compete as CPE   -   -   -

    - ISDN Introduction Cuts Need for   0   2   5
      Specialized Telecom Equipment   0   -   -

10. TELECOMMUNICATIONS EQUIPMENT **(3)**

---

a. <u>Definition</u>

- Telecommunications equipment includes those devices that facilitate the sending, mid-stream processing, or receiving of electronic signals used in the transfer of "messages." The signals may be analog or digital and the message media voice, text, data, or image.

---

b. <u>User/Buyer Characteristics</u>

    (1)   User

- Users are primarily concerned with ease of use, ease of access to other end points, accuracy of the transmission, and presentation of transmitted information in a useful format.

- Telecommunication equipment is used by corporate telecommunications managers or third-party vendors who are responsible for serving the end users' needs and maintaining and controlling vendor/receiver access, quality of the telecommunications, impact on other corporate systems, and costs of the services provided.

    (2)   Buyer

- Buyers of sending/receiving equipment tend to be the users with telecommunications manager oversight in all cases, especially for analog/digital equipment.

- Telecommunications managers are also the buyers of processing equipment. In these, oversight is by the IS department head and corporate-level heads of operations, CFO, and even CEO, especially in SEs.

INPUT

c.   Applications/Usage

- **Document Transmissions**--there is a
  growing need for both transmitting copies and
  actual documents rapidly and reducing of
  carrier costs.

4	4	3
+	0	-

- **Available Information**--usage of send/receive
  equipment has increased with more information
  available on-line. Usage has also impacted
  the mid-stream processing.

4	5	5
+	+	+

- **Voice Mail Usage**--voice mail usage has
  increased as an alternative to memos, letters,
  and "telephone tag."

4	5	4
+	+	+

- **Digital Formats**--extensive need for trans-
  mission of digital and formatted messages
  is increasing the need for digital telecom-
  munications capabilities.

3	4	5
+	+	+

- **Telecommunications Volumes**--increasing
  needs for connectivity at all levels has created
  additional capacity demands on processing
  equipment.

3	4	5
+	+	+

- **Access to Divergent Protocols**--absence of
  standards has created a need for protocol
  conversions but will gradually give way to
  standardization.

4	3	2
+	0	-

INPUT

- **Increased Customization**--the application of
  specific devices to narrow usage (e.g., tele-
  printers for hard copy, V/D terminals for tele-
  marketing) will spur market.

3	4	4
0	+	+

d.   Technological Impact

- **Miniaturization**--smaller chip sets are leading
  to greater portability, further expanding the
  reach of telecommunications.

3	4	3
+	+	0

- **Digital Cellular**--this will alleviate cabling
  and increase accessibility.

3	4	5
0	+	+

- **Integrated Functionality**--as services are
  combined within some types of equipment,
  interim solutions will disappear
  (e.g., modems, voice PBX, converters,
  teleprinters, videotex-only terminals).

3	4	4
0	-	-

- **More Powerful Mainframes**--in-board
  communications processors will eliminate
  the need for front-end's processors.

3	4	4
0	-	-

- **OCR/FAX Capabilities in PCs**--document
  transmission via PCs will emerge and then
  fade under video technology.

3	4	4
0	+	-

- **New Communications Technology**--will
  reduce cost barriers, open opportunities, increase
  demand.

2	3	5
+	+	+

INPUT

- **Video Image Communications Technology Improvements**--video conferencing, education, security applications will excite equipment markets

1	2	3
0	+	+

e. <u>Software Impact</u>

- **See Technology Impact**--many of the features above will be embedded in the software.

- **Artificial Intelligence**--language translation and protocol matching software will enhance digital equipment, increase usage, and reduce conversion equipment and complexity.

2	3	4
0	+	+

f. <u>Market Size and Growth</u>

Category: Telecom Equipment	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	7800	9555	7%	10224	11488	6%	12177	14246	4%
SE (Small)	7000	8575	7%	9176	10505	7%	11240	15293	8%
SUM (Total)	14800	18131	7%	19400	21993	6%	23418	29538	6%
------Components------									
Digital PABX	178	373	28%						
Digital Centrex	95	186	25%						
Analog PABX	2615	2615	0%						
Analog Centrex	2820	2418	-5%						
Modems/Couplers	1955	2602	10%						
Earth Stations	705	1158	18%						
Concentrators	197	228	5%						

INPUT

   (1) Marketplace Factors

- **Price Declines**--price competition on PBX/CBX, FAX, teleprinters, modem/copiers, and the use of PCs as alternatives to medium-specific devices has impacted unit sales.

4	5	3
-	-	0

- **High Price**--markets are slower on high-priced items such as integrated V/D terminals, videotex, earth stations. As volume increases, prices will decline.

4	3	3
-	-	0

- **Increased Marketing**--increased expenditures, niche-orientation will drive market (but with dimishing returns per dollar).

2	4	2
+	+	+

- **Minicomputers Used as Switches**--reduces PBX/CBX opportunities.

2	3	4
-	-	-

- **Microcomputers Used as Telephones**--negatively impacts regular handset and specialized telecom devices.

1	2	4
0	-	-

- **Introduction of ISDN**--will eliminate need for some devices altogether (e.g., modems) and make it easier for general purpose equipment to substitute for others.

0	2	5
0	-	-

INPUT

- AT&T*

3	2	1
-	-	-

*Successful development of ISDN could
increase AT&T share of remaining equipment
market as well.

- Northern Telecom

2	3	3
-	-	-

- IBM/Rolm

2	2	3
0	0	0

- Other (mainly offshore)

2	3	2
+	+	+

INPUT

OTHER PERIPHERALS (3)

- **Growth Drivers**

  - **Applications-Specific Software**   2   3   4
    Simplifies Special Interfaces   +   +   +

  - **Improved Graphics Software Enhances**   2   3   1
    Plotter Market   +   +   +

- **Growth Inhibitors**

  - **EDI Reduces Paper, MICR and OCR**   2   3   4
         -   -   -

  - **Industry Workstations (e.g., Plastic**   2   3   3
    Card Terminals) Replace Peripherals   -   -   -

  - **New Applications Move Away from**   2   3   4
    Cards and Paper   -   -   -

  - **Some Interfaces Going In-Board,**   2   3   3
    Especially in Engineering and   -   -   -
    Scientific Market

11. OTHER PERIPHERALS **(3)**

---

a. <u>Definition</u>

- Includes input/output equipment that handles punched cards, paper tape, COM, plotters, MICR, and media to be optically scanned as well as interfaces to laboratory, engineering, or manufacturing equipment.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Except for interfaces to lab, engineering, or manufacturing equipment, IS operations is generally the user. In very large enterprises operating departments or decentralized IS personnel may be the users.

(2) Buyer

- Most often, IS acts as the buyer. Users are the buyers in some cases, particularly in laboratories, engineering departments, and similarly specialized environments.

c. <u>Applications/Usage</u>

- **Application-Driven Use**--applications make use of punched cards and paper as input as well as records of payment/service receipts in industry-specific applications.

3	2	1
+	+	0

- **Use of Media in Automated and Manual Systems**--scanning of paper as input and production of COM for off-line retrieval both make use of presently convenient media.

2	1	0
+	+	0

INPUT

- **Connectivity Increasing Productivity--** interfaces between computers and lab, engineering, and manufacturing equipment facilitate applications that increase productivity.

3	4	4
+	+	+

- **Increasing Electronification--**increases demand for COM and optical scanning for audit and archival purposes.

2	3	1
+	+	0

d. <u>Technological Impact</u>

- **EDI Reducing Paper, Cards, and Paper Use--**reduction of MICR and optically scanned documents through substitution of EDI.

2	3	4
-	-	-

- **Industry Workstations--**improved cost/performance of terminals which use plastic cards in banking, medical, educational, and other fields reduces need for other peripheral.

2	3	3
-	-	-

- **Smart Card Technology--**reduction in use of paper as plastic card offers more capability for interim storage.

2	3	3
-	-	-

- **Optical Storage--**negatively impacts microfiche and COM.

1	2	3
-	-	-

- **Graphics and Color--**impacts plotter market positively in short run.

2	3	1
+	+	0

INPUT

e. Software Impact

- **Generation of Better Applications**--use of
  application generators and AI to create better
  software forces users to abandon cards and
  paper.

2	3	4
-	-	-

- **Application-Specific Software**--will facilitate
  use of special interfaces by simplifying capture,
  translation, and reduction of data.

2	3	4
+	+	+

- **Improved Graphics Software**--drives plotter
  market until printers take over.

2	3	1
+	+	+

f. Market Size and Growth

Category: Other Peripherals									
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1350	1797	10%	1977	2392	10%	2631	3579	8%
SE (Small)	440	618	12%	692	853	11%	947	1288	8%
SUM (Total)	1790	2415	10%	2669	3245	10%	3578	4867	8%
----Components----									
Plotters	1200	1825	15%						
MICR	60	62	1%						
OCR/Scanning	150	184	7%						
COM	180	154	-5%						
Other (voice response, etc.)	200	391	25%						

g. Marketplace

   (1) Marketplace Factors

- **Peripheral Vendors**--EDI as well as plastic technology vendors will join with CPU and network vendors to "liberate" card, paper, and, to a lesser extent, COM users.

2	3	3
-	-	-

- **Vendors to Engineering and Scientific Market**--DEC, HP, and others will improve interfaces to technical equipment to sell hardware. Fewer special devices will be needed.

2	3	3
-	-	-

- **Offshore Vendors**--will use new peripheral directions (smartcards, interfaces to technical equipment) to leverage sales.

1	2	2
-	-	-

- **Account Control**--companies with application knowledge and industry-oriented marketing will respond to needs (e.g., IBM, DEC, UNISYS).

3	2	2
+	+	+

INPUT

(2)   Marketshare Gains/Losses

- IBM

4	4	4
+	+	+

- UNISYS

3	3	2
+	+	0

- NCR

3	3	2
+	+	0

- DEC

0	1	2
0	+	+

- HP

4	3	3
+	+	+

- Others

4	3	2
+	+	0

SYSTEMS SOFTWARE (1)

- Growth Drivers

  - Strategic, On-Line Systems Spawn   3   4   5
    New Performance and Feature Needs   +   +   +

  - New Hardware Technologies Require   2   3   4
    Increasing Functionality   +   +   +

  - New Development Methodologies,   2   3   3
    Tools, Platform Independence   +   +   +

  - Whole New Operating System Environ-   3   5   4
    ment Introduced in Intermediate   +   +   +
    Timeframe

- Growth Inhibitors

  - Standards Impede OS Development   3   2   2
                                           -    -   0

  - Decreasing Hardware Pricing Puts   2   3   4
    Pressure on Systems Software   -   -   -

  - Function Integration in OS Reduces   3   3   4
    Individual, Incremental Pricing   -   -   -

12.   SYSTEMS SOFTWARE **(1)**

---

a.   <u>Definition</u>

- Software that enables the computer/communications system to perform basic functions which are interim steps in providing the end user with the desired final result. Systems software includes system control, data center management, and application development products.

---

b.   <u>User/Buyer Characteristics</u>

   (1)   User

- For end user procurements, particularly at the PC level, the user will select the systems software to suit particular needs. There may be guidance provided by the IS department or central procurement through an existing plan providing for bulk corporate purchases or site license. Over the forecast period, corporate guidance will become stronger.

- For departmental procurements, the IS directory and/or the system administrator will select the systems software in close concert with end users and department management.

- For central systems, obviously the IS department is both user and buyer. An exception is in SEs where systems software is submerged in a turnkey or bundled arrangement.

(2)   Buyer

- For micro-level procurements, corporate purchasing may issue the purchase order but the decision and approval process will rest with the user, usually operating under IS-sponsored guidelines.

- Systems software for larger systems will continue to be purchased by IS in LEs and in interaction with top management in the smallest SEs.

c.   Applications/Usage

- **Productivity**--continued emphasis on more productive use of resources, machines, material, people, and money.

3	3	3
+	+	+

- **Delivery of Resources to User**-- effectively delivers CPU/storage resources to the end user.

3	4	4
+	+	+

- **DBMS Changes**--evolution of relational DBMS to distributed RDBMS, and RDBMSs becoming applications foundation.

2	3	4
+	+	+

- **Applications Integration**--strategic uses, continued expansion of utility, drive toward greater function, and application integration.

3	3	4
+	+	+

INPUT

- **New Operating Systems Environments**--
  from a multiuser O/S on micros to major
  changes in mainframe O/S including
  security, fault-tolerance, single view
  of similar devices, and device allocation.

3	5	4
+	+	+

- **Artificial Intelligence**--integration with most
  software development systems and tools.

2	3	3
0	+	+

- **Software Development Changes**--replacement
  of traditional methods of CASE, 4GL, and 5GL,
  eventually allowing users to describe require-
  ments in their simplest terms.

2	3	3
+	+	+

- **Security**--security and control for distributed
  applications.

3	3	3
-	+	+

- **Application Distribution**--new standards,
  systems tools/architecture allow applications
  to become independent of platform and
  location for both inter- and intra-company.

3	3	4
0	+	+

- **On-Line Response Emphasis**--data becomes
  more "time-oriented." Applications require
  information instantly. On-line transaction
  processing price/performance is critical.

3	4	5
+	+	+

d. <u>Technological Impact</u>

- **Faster and Additional Capacity
  Components**--provides development of
  more powerful workstation and hardware/
  software architectures.

2	3	4
+	+	+

INPUT

- **Graphics**--graphics standards take hold; performance is catalyst to increase usage as much functionality migrates to silicon.

3	3	3
+	+	+

- **New Technologies**--optical storage, image processing, electronic filing, and parallel processors require increasing systems software sophistication.

2	3	4
+	+	+

e.   Software Impact

- **Compound Documents**--integration of data/text/voice/image creates new document types.

2	2	3
0	0	+

- **"Standards" (e.g., DB2/SQL)**--interfacing and connectivity standards throttle software operating environment enhancements while potentially promoting universal applications environment.

3	2	2
-	-	0

- **Application-Specialized Systems**--specialized applications operating environment as opposed to generalized O/S. Requires less tools, incurs less overhead.

1	2	3
0	+	+

- **Function Migration to Hardware**--will defend hardware and reduce systems software market but may also serve to reduce price competition.

2	3	2
0	-	+

- **Function Migration to OS**--proprietary aspects will keep prices high.

3	3	2
+	+	+

f. **Market Size and Growth**

Category: Systems Software	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	6000	11440	24%	14185	20427	20%	24512	44383	16%
SE (Small)	1500	3000	26%	3781	5813	24%	7208	14947	20%
SUM (Total)	7500	14440	24%	17966	26240	21%	31721	59330	17%
------Components------									
Systems Control	3008	5598	20%						
Data Center Mgt.	1610	3623	26%						
Applications	2882	5219	19%						

g. **Marketplace**

    (1)   Marketplace Factors

- **Decreasing Software Prices**--software prices maintain correlation with hardware price/performance, causing pricing erosion.

2	3	4
-	-	-

- **Function Absorption**--integration causes declining incremental pricing as functions are co-mingled.

3	3	4
-	-	-

- **Pricing Structure Changes**--sale to lease to site license, charging for support, and charging for maintenance will have positive impact in the long run.

3	4	3
-	+	+

INPUT

- **Business Factors**--mergers and acquisitions are necessary to reap economies of scale and critical mass for channel/distribution and R&D funding. Some dampening of market potential, at least in short-intermediate term.

3	4	4
-	-	0

    (2)   Marketshare Gains/Losses

- IBM

3	3	3
+	+	+

- Other Computer Manufacturers

2	2	3
+	+	+

- Software Houses

3	3	4
-	-	-

MAINTENANCE SERVICES (1)

- **Growth Drivers**

    - **Shift to Software Support While**   3   4   5
      Software Grows More Complex   +   +   +

    - **Other Professional Services-Type**   2   5   5
      Support (e.g., Education, Performance   0   +   +
      Consulting)

    - **New Technical Applications Require**   3   4   4
      Intensive Hardware/Software Support   +   +   +

- **Growth Inhibitors**

    - **Price Erosion in Synch with Lower**   3   4   4
      Hardware Prices   -   -   -

    - **Lower Volumes and Prices in Response**   2   2   2
      to Better Reliability, Availability,   -   -   -
      Maintainability

13. MAINTENANCE SERVICES **(1)**

a. <u>Definition</u>

- Maintenance services are all activities performed for the diagnosis and repair of data processing hardware and software. This includes all ancillary support activities that improve the operations of IS hardware and software, such as planning, consulting, training, and (end-user operational) documentation. All revenue figures given account for separately billed service activities, charged on a contractual, per-incident, or time-and-material basis.

b. <u>User/Buyer Characteristics</u>

(1) User

- Many SEs, defined as 5,000 emloyees and smaller, are still large enough to use mainframes or larger superminicomputer systems. Thus, their service requirements will not vary significantly from those of larger enterprises. While it is true that the volume of data processing equipment on-site will be less, the small enterprise will still require the types and level of services as the LE user.

(2) Buyer

- Users, except in the PC realm, have little to do with maintenance services, save being indirect beneficiaries. The buyer is either the IS department, a remote department operating under IS guidelines, or, in the case of very small SEs, top management.

INPUT

c. Applications/Usage

- **Hardware Maintenance**--traditional
  system/subsystem services relatively decline.

3	2	1
0	-	-

- **Software Support**--code "fixes," training,
  consulting, installation, and performance
  "tuning" increase.

3	4	5
+	+	+

- **Educational Service**--previously "bundled."
  Increased user needs warrant independent
  sales.

2	3	4
0	+	+

- **Professional Services**--consulting and
  planning; moving toward "performance"
  support.

2	5	5
0	+	+

- **Maintenance of Integrated Systems**--
  maintenance management and support
  of all interconnected processing systems.

1	3	5
0	+	+

d. Technological Impact

- **Improved Architecture**--allowing board
  swaps and component exchanges.

2	2	2
-	-	-

- **Remote Support Development**--currently
  emphasizes diagnostics, moving toward
  support implementation.

3	3	3
0	0	0

INPUT

- **Improved Hardware Reliability/Maintain-ability**--reduces skill levels required and frequency of service.

2	2	2
-	-	-

e. Software Impact

- **Improved Problem Data Bases**--incorp-orating AI, improving "predictive" diagnosis capabilities.

2	2	2
0	-	-

- **"Simpler" Hardware Leads to "Complex" Software**--e.g., RISC technology increases software support.

1	3	4
0	+	+

- **Technical Applications**--heavy technical and computer-based applications increase centralized software support requirements.

3	4	4
+	+	+

- **Expanded Concept of Software Support**--to include both remedial and performance support.

2	3	4
0	+	+

INPUT

f. **Market Size and Growth**

Category: Maintenance Services	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	11550	15373	10%	16910	19724	8%	21302	28981	8%
SE (Small)	3910	5347	11%	5936	7313	11%	8118	12323	11%
SUM (Total)	15460	20720	10%	22846	27038	9%	29420	41305	9%
-----Components-----									
Hardware Maintenance	13990	16195	5%						
Software Maintenance	950	1811	24%						
Professional Services	340	617	22%						
Education/Training	180	274	15%						

g. **Marketplace**

(1) Marketplace Factors

- **Current Absence of Software Support**-- user dissatisfaction is growing.

4	3	3
-	0	0

- **Third-Party Maintenance**--particularly in intermediate and small systems, competition increases but at diminished growth rate.

3	2	1
+	+	+

- **Price-Sensitivity**--greatest in hardware maintenance service activities.

3	4	4
-	-	-

INPUT

(2)   Marketshare Gains/Losses

- IBM

2	2	3
+	+	+

- PCMs--NAS, Amdahl, Japanese Companies

4	2	2
-	0	0

- DEC

3	4	2
+	+	+

- TPM

2	2	2
-	-	-

- Others

1	1	1
0	0	0

OTHER IS PRODUCTS AND SERVICES

APPLICATION SOFTWARE (1)

- **Growth Drivers**

    - **More Function- and Industry-Specialized Packages Available**

3	4	5
+	+	+

    - **Move Toward On-Line, Integrated Applications Obsoletes Existing Software**

2	4	3
+	+	+

    - **New Operating System Introductions**

3	3	4
+	+	+

    - **Migration Downward to Smaller Platforms Opens New Opportunities**

3	4	4
+	+	+

- **Growth Inhibitors**

    - **Improved Development Methodologies Reduce Need for Outside Packages**

2	3	4
-	-	-

    - **Standards Impede Development in Short and Intermediate Term**

2	3	4
-	-	0

B. OTHER INFORMATION SYSTEMS PRODUCTS AND SERVICES

1. APPLICATIONS SOFTWARE **(1)**

> a. Definition
>
> - Software that performs a specific function directly related to solving a business or organizational need. Applications software provides information directly for use by the end user and includes industry-specific and cross-industry products.

b. User/Buyer Characteristics

- In the LEs, the IS director and members of the IS department will select applications software based on requirements specified by using departments. If the software is industry-specific and/or far reaching in scope, the users, using departments, and, in some cases, top management may play a role.

- In the following cases, the user may play a pivotal role and may be the buyer as well.

  - An application destined specifically for a single-user department; e.g., CAD, payroll, MRPII, etc.

  - An end-user personal productivity package, usually within established IS guidelines and increasingly based on preauthorized, companywide, multiple site licenses.

  - A mainline "core" upon which the business is operated, in which case top or functional management will be primary buyer.

INPUT

- Software for large systems will, by and large, continue to be an IS decision in close liasion with functional departments and users.

c. Applications/Usage

- **Office Systems**--automation of office functions: electronic mail, electronic filing, and compound documents, including voice.

2	3	4
+	+	+

- **End-User Applications**--more specialized, focused applications packages developed and marketed.

3	4	5
+	+	+

- **Vertical Applications**--move from generalized to specialized applications software; all industries/functions targetted for replacement. One effect is to maintain price levels.

2	3	4
+	+	+

- **Application Integration**--users desire one set of applications compatible and operating together; reduces options, maximizes training, and improves productivity.

2	2	2
+	+	+

- **Hardware "Dragalong"**--systems justified on one application provide justification for add-on applications.

2	2	2
+	+	+

- **On-Line/Interactive/Integrated Applications**-- on-line access to all applications makes existing software base obsolete.

2	4	3
+	+	+

INPUT

- **Pace of Change**--applications life cycle
  continue to shorten.

2	3	3
+	+	+

d. <u>Technological Impact</u>

- **New Hardware Capacity/Performance**--
  faster processors, larger memory, and new
  peripherals provide new applications opportunities.

3	3	3
+	+	+

- **Standards**--de facto and negotiated standards
  allow easier integration but limit variation; e.g.,
  windows. Restrains potential users.

2	4	3
0	-	-

- **Standards**--(countervailing influence)-ability
  to easily implement application in a stable
  environment.

1	3	4
+	+	+

- **Application Migration**--improved hardware
  capacity and performance let applications migrate
  to smaller platforms.

3	4	4
+	+	+

e. <u>Software Impact</u>

- **New Operating Systems**--provide opportunities
  for more flexible applications and responsiveness;
  e.g., improved on-line transaction processing, simpler
  file access.

3	3	4
+	+	+

- **Generalized Applications Architecture**--
  common user interface, programming standards
  will impact applications improvements, negatively
  in the short and intermediate term.

2	3	4
-	-	0

- **Software Development Methodologies**--
improved development methods will allow user
to more easily develop their own customized
solutions to needs.

2	3	4
-	-	-

- **Computer-Aided Instruction**--on-line
training capability, programmed instruction, and
in-board tutorials make installation easier.

2	3	3
0	+	+

- **Ease of Adaptation**--architecture will facilitate
user customization and future maintenance
of packaged software.

2	3	3
+	+	+

f.　<u>Market Size and Growth</u>.

Category: Applications Software	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	5400	9331	20%	11197	15067	16%	17478	29520	14%
SE (Small)	2900	5266	22%	6424	8945	18%	10556	19112	16%
SUM (Total)	8300	14597	21%	17622	24013	17%	28034	48632	15%
------Components------									
Lg. System Ind. Spec.	3340	6215	23%						
Lg. System Cross Ind.	2517	3536	12%						
PC Industry Specific	721	1978	40%						
PC Cross Industry	1720	2898	19%						

g.　<u>Marketplace</u>

(1)　Marketplace Factors

- **Strategic Partnering**--computer manufac-
turers enter into alliances with applications
vendors; e.g., IBM/Hogan, DEC/Interleaf.

3	3	2
+	+	0

INPUT

- **Computer Manufacturers Pursue Market**-- manufacturers themselves develop vertical and horizontal applications.

1	2	3
0	0	+

- **Mergers/Acquisitions and R&D Funding**-- vendors invest in key applications developers or assist in venture startups.

1	3	3
0	+	+

  (2) Marketshare Gains/Losses

- IBM

2	3	3
0	+	+

- Other Computer Manufacturers

2	2	3
0	0	+

- Software Houses

4	3	2
+	+	+

- Other (e.g., Spinoffs, Arthur Andersen, BOCs)

1	1	1
+	+	+

INPUT

PROFESSIONAL SERVICES - EDUCATION (2)

- **Growth Drivers**

  - **New CBT Tools Make Better Training**   3 4 4
                                                    + + +

  - **New, Complex Systems Implementation**   2 3 3
                                                    + + +

  - **Turnover, Lack of Fundamental Skills**   4 4 4
                                                    + + +

- **Growth Inhibitors**

  - **New Alternative Delivery Vehicle**   2 3 4
                                                    - - -

  - **Embedded Help and On-Board AI**   1 2 4
    Reduce Training Requirement   - - -

  - **Education Remains an "Afterthought"**   2 2 2
                                                    - - -

2. PROFESSIONAL SERVICES - EDUCATION **(2)**

---

a. <u>Definition</u>

- Services that help people acquire new skills, techniques, or knowledge related to computers. Vendor-supplied education includes "training" for purposes of this discussion.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Since the IS product/service vendor typically includes education as a part of the purchase, the vendor's education offering usually weighs heavily in the selection process, especially in SEs.

(2) Buyer

- Supervisors of the prospective learners are generally the buyers of educational services and the purchasers of the IS product/service as well. These buyers are typically in a position to specify the content of the instruction if not the method of instruction but generally rely on the IS supplier for these decisions. As the instruction is work-related, buyers desire that the instruction be practical, specific to the IS environment, and efficient. The latter is critical in that the buyer is paying a stiff "penalty" for the education--the learner's salary and benefits while he/she is learning, the learner's replacement on the job during the process, and the fees of the provider.

- Particulary in SEs, there is economic and practical pressure for training to be on-site and, wherever accessible, self-adminstered.

INPUT

c.   Applications/Usage

- **New Product Implementation**--every new
  product requires education of the user.

2	3	3
+	+	+

- **Complex Systems**--strategic, complex
  systems implementation places extra-
  ordinary education demands on users.

2	3	3
+	+	+

- **New Users of Existing System**--fast turnover
  and fundamental lack of skills demand continuous
  retaining.

4	4	4
+	+	+

- **New Applications Tend Toward Multiusers**--
  spreads training requirement.

2	3	4
+	+	+

- **General Foundation Training Required**--
  broader underpinning required as a prerequisite
  of future system training.

2	2	2
+	+	+

d.   Technological Impact

- **Intelligent Systems**--these are essentially
  turnkey systems that require little operation
  intervention.

1	2	3
0	0	-

- **Video and CD-I**--marriage of CBT,
  animation, and full audio/video as single
  medium creates powerful training tools.

3	4	4
+	+	+

- **Delivery Vehicle**--CD ROM and CAI provide
  alternative means of delivery solutions.   Older
  methods are adversely affected.

2	3	4
-	-	-

INPUT

e. Software Impact

- **Embedded "Help"**--on-board tutorials and help
  screens for users in packaged software reduce
  training requirements.

1	2	3
0	-	-

- **Embedded "Knowledge"**--on-board AI reduces
  skill required of users.

1	2	4
-	-	-

f. Market Size and Growth

Category: Professional Services - Education								
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	870	1503	20%	1804	2598	20%	3117	6464	20%
SE (Small)	470	812	20%	975	1403	20%	1684	3492	20%
SUM (Total)	1340	2316	20%	2779	4001	20%	4801	9956	20%
------Components------									
All	1340	2316	20%						

g. Marketplace

(1) Marketplace Factors

- **"Vendor Support Item"**--education is frequently
  the supplier's "goodwill." This will change if
  vendors find a market large enough to address,
  that is independent of the product.

2	3	3
0	+	+

- **Education as an "Afterthought"**--most product
  decisions are not based on the type or quality
  of education offered.

2	2	2
-	-	-

INPUT

- **Education as the Basis of Competition**--
  vendors will begin to focus attention on the criticality
  of education and try to differentiate themselves on
  that basis.

2	3	3
0	+	+

    (2)   Marketshare Gains/Losses

- IBM

2	2	2
0	+	+

- Other Hardware Manufacturers

2	2	3
-	-	-

- Professional Services Vendors

2	3	4
+	+	+

- Training Specialists

2	3	3
-	-	-

- Other Information Services Companies

1	2	3
+	+	+

INPUT

PROFESSIONAL SERVICES - CUSTOM PROGRAMMING (1)

- **Growth Drivers**

  - **Development Backlog**

3	4	2
+	+	+

  - **Need to Customize Packages**

3	4	4
+	+	+

  - **Shortage of In-House People, Lack of Needed Skills**

2	3	3
+	+	+

  - **Increased Technical Complexity of Integrated, Interconnected Systems**

3	3	3
+	+	+

- **Growth Inhibitors**

  - **New Development Methodologies Reduce Need for Custom Work**

2	3	4
-	-	-

  - **Migration of Functions to Hardware from Software**

2	3	4
-	-	-

  - **Improvements in Packaged Software Reduces Custom Need**

2	3	4
-	-	-

3. PROFESSIONAL SERVICES - CUSTOM PROGRAMMING (1)

---

a. <u>Definition</u>

- Development of a software system on a custom basis--includes definition of requirements, system design, contract programming, and enhancement of existing software.

---

b. <u>User/Buyer Characteristics</u>

   (1) User

- In most enterprises of all sizes the user is the individual or group charged with the responsibility of developing or enhancing a software system, typically a development manager in the IS department overburdened with work that cannot be readily accomplished using in-house people.

- Another category of user is the end user department with sufficient autonomy to develop its own systems. In very small enterprises this becomes synonymous with the enterprise itself, in which case the buyer may be top management.

   (2) Buyer

- The buyer is often the user. Where the emphasis is on software resources and skills, the buyer/user is the software development manager. For applications-specific projects, the buyer is the end user working in concert with IS, typically in a taskforce arrangement in LEs. In SEs, the IS manager and his/her immediate superior and the functional department head for whom the software is to be developed are the key decision makers.

c. Applications/Usage

- **Development Backlog**--delays in meeting
  business needs leads many users and IS
  managers to employ outside resources.

3	4	2
+	+	+

- **Lack of In-House Expertise**--lack of technical
  knowledge in communications and data
  management required for current projects
  encourages use of outside vendors.

2	3	3
+	+	+

- **Bias Toward Using In-House Staff**--
  more true of LEs, not SEs.

3	3	2
-	-	-

- **Packages More Desirable**--acceptance
  of improved packages reduces cost and outside
  dependencies.

2	3	4
-	-	-

- **Growing Need to Customize Packages**--
  willingness to use packaged software is
  accompanied by mounting need for customi-
  zation and/or add-on.

3	4	4
+	+	+

- **Software Development as Part of Business
  Development**--as new endeavors, especially
  information-intensive ones, are started, the
  tendency will be to buy, not make, in the
  interest of time and risk.

2	3	3
+	+	+

- **Tendency to Use Software Packages and
  Turnkey Systems**--easily modifiable packages
  will reduce need for customized software
  development.

2	3	4
-	-	-

INPUT

- **Increasing Technical Complexity Drives Custom Programming**--new and changing storage devices, communications equipment, and interconnection needs create opportunities.

3	3	3
+	+	+

- **Hardware Replacing Software**--application-specific circuitry will handle many routine data management, data transfer, and interfacing tasks.

2	3	4
-	-	-

e.   Software Impact

- **New Development Methodologies**-- use of CASE, ADT, application generators, AI, and other CASE techniques will reduce volume of custom work.

2	3	4
-	-	-

- **Distribution of Data Bases/Integration with User Applications**--these trends require additional knowledgeable people to meet an expanding market.

2	3	3
+	+	+

f.   Market Size and Growth

Category: Professional Services - Custom Programming	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	5389	8196	15%	9425	11613	11%	12890	16897	7%
SE (Small)	1340	2146	17%	2511	3263	14%	3720	5447	10%
SUM (Total)	6729	10342	15%	11936	14876	12%	16611	22343	8%
------Components------									
All	6729	10342	15%						

INPUT

(1)   Marketplace Factors

- **Intensifying Competition**--more small vendors, and more vendors from other areas of the industry are crowding in. Impact on market size is neutral.

4	4	3
0	0	0

- **Attempts to Reduce Custom Work**--package vendors, specialists in development methodology, and hardware firms will develop approaches.

2	3	3
0	-	-

- **Offshore Firms**--will use technology and assembly line techniques to capture a share of the market and drive hardware selection, mostly without success.

2	2	2
0	0	0

- **Hardware Vendors**--increasing volume of the work by IBM, DEC, and others.

3	3	2
+	+	+

(2)   Marketshare Gains/Losses

- IBM and Other U.S. Hardware Vendors

3	3	2
+	+	+

- Major Independent PS Vendors

3	3	3
+	+	+

- Consulting and Accounting Firms

3	4	4
+	+	+

- Others (smaller companies, independents, spinoffs).

2	3	4
-	-	-

INPUT

PROFESSIONAL SERVICES - CONSULTING (1)

- Growth Drivers

    - Trend to Complex, Integrated   3   4   5
      "Strategic" Systems   +   +   +

    - Wider IS Usage Throughout   2   3   4
      Organizations   +   +   +

    - Continuous Introduction of New   2   3   4
      Technology   +   +   +

- Growth Inhibitors

    - Vendors Give Away Consulting and 3   4   4
      Software to Maintain Accounts   -   -   -

    - Improved Software Reduces Complexity 1   2   3
      and Need for Customization   -   -   -

    - Vendors Encounter Skill Shortages   3   3   3
                                            -     -   -

    - Perceived Value Falls with Decreasing 4   3   3
      Hardware and Software Prices   -   -   -

4.   PROFESSIONAL SERVICES - CONSULTING **(1)**

---

a.   Definition

- Advice on computer-related issues, including feasibility studies, hardware/
  software/communications component selection, integration, and evaluation.
  Issues are usually management oriented.

---

b.   User/Buyer Characteristics

(1)   User

- There is a strong need for consulting assistance in the selection, planning, and
  integration of multivendor systems components in LEs. The diversity of product
  and the absence of rigorous standards in this environment drive the user to seek
  outside assistance in pulling the pieces together into an integrated whole.

- SEs have similar problems but more often find pre-engineered packaged and
  turnkey solutions to which they are able to adapt. Evaluating available solutions
  and determining the degree of "fit" is a proper outside consultant's role,
  frequently employed by top or operating management with the help of whatever
  IS resources exist in the organization.

(2)   Buyer

- In LEs the buyer is most often IS with a voice, and sometimes a commanding role
  from functional management where applications-specific considerations
  predominate.

- In many enterprises of all sizes, and almost universally in small ones, top management plays a major role in choosing consultants for this type of service. In cases where a vendor's credibility is extremely high, the enterprise may depend solely upon the vendor for advice, although this approach is becoming less common with increasing system complexity and the predominance of multivendor solutions.

c. <u>Applications/Usage</u>

- **Connectivity of Divergent Technologies**-- consultants perform an important function of designing integrated systems.

4	3	2
+	+	+

- **Skills**--unique technical requirements may require special skills not available in-house.

2	3	3
+	+	+

- **Industry-Specific Directions**--newly evolving industrywide standards drive new developments on unfamiliar ground.

2	4	3
+	+	+

- **"Strategic" Implementations**--new systems tend to reach broader and deeper, hence are more complex.

3	4	5
+	+	+

- **Distribution of IS Usage**--more points of use of IS throughout organizations create more opportunity, especially in LEs.

2	3	4
+	+	+

- **Data Base of Skills and AI Techniques**-- expertise will be captured in systems.

1	1	3
0	0	-

d.   Technological Impact

- **Changing Technology (general)**--each major change requires merging old and new systems. Conversions are an opportunity.

3	4	3
+	+	+

- **Open Architecture**--industry standards could ultimately negate much of the consultant's role.

2	3	3
0	-	-

- **Plug Compatibility**--to the extent that suppliers make products transparently compatible, the need for complex interfacing is reduced.

1	2	3
+	0	-

- **Complexity**--each new technology requires outside expertise.

2	3	4
+	+	+

e.   Software Impact

- **Intelligent Compatibility**--software and hardware products will be introduced with self-integrating capabilities.

2	3	4
0	-	-

- **Better, Easier to Modify and Maintain Software**--improvements reduce complexity and need for customization.

1	2	3
-	-	-

- **Increased Software Diversity**--requires more and more diverse expertise.

2	3	3
+	+	+

INPUT

Market Size and Growth

Category: Professional Services - Consulting									
		---Short term---			---Intermediate---			----Long term----	
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1454	2513	20%	3015	4198	18%	4954	8969	16%
SE (Small)	610	1054	20%	1265	1791	19%	2132	4133	18%
SUM (Total)	2064	3567	20%	4280	5989	18%	7085	13102	17%
------Components------									
All	2064	3567	20%						

g. **Marketplace**

(1) **Marketplace Factors**

- **Upgrade Policies**--to maintain accounts, vendors offer upgrades when hardware or software changes .

3	4	4
0	-	-

- **"Free" Consulting from Supplier**--to sell the product, consulting is bundled.

3	4	4
-	-	-

- **Supply of Vendor Consultants**--skilled personnel are in short supply, in general.

3	3	3
-	-	-

- **Supply of Skills**--conversely, user shortage of skilled people increases demand.

3	3	3
+	+	+

- **Changing Vendor Architecture**--when architecture changes, manufacturers enjoy a temporary edge. Knowledgeable consultants are in especially short supply at that point.

3	4	3
-	-	-

INPUT

- **Geographic Fragmentation of Market**--
  many small consultants with strong local
  relationships promote faster market growth.

3	4	3
+	+	+

- **Consulting Charges in Context with
  Hardware Costs**--consultants find it difficult
  to charge full value as hardware prices decrease.

4	3	3
-	-	-

    (2)   Marketshare Gains/Losses

- IBM

4	3	2
+	+	0

- Other Manufacturers

2	2	1
-	-	0

- Consulting and Professional Services
  Vendors

3	2	3
-	0	+

- Others

3	2	2
-	-	-

PROFESSIONAL SERVICES - FACILITIES MANAGEMENT (1)

- Growth Drivers

  - Changes: Technology, Application   3   3   3
    Requirements, Volume, Architecture   +   +   +

  - Parallel Operations During Develop-   3   4   4
    ment and Cutover   +   +   +

  - Distribution of Function to Geographi-   3   4   4
    cally Dispersed Units   0   +   +

- Growth Inhibitors

  - Move to Turnkey and Smaller Systems   3   4   4
    Negates Need   0   -   -

  - Control Issue is Paramount in Short   4   3   2
    and Intermediate Term   -   -   0

5. PROFESSIONAL SERVICES - FACILITIES MANAGEMENT **(1)**

---

a. <u>Definition</u>

- PSFM involves the management of all or part of a user's data processing functions under a long-term (not less than one year) contract. Unlike processing services facilities management, in this case the computers are owned or leased by the user. The vendor provides the staff to operate, maintain, and manage the facility.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Users are generally the functional department heads, although in small enterprises users may be top management.

(2) Buyer

- While top management occasionally buys this service, buyers are typically the users, department heads, or IS managers with higher approval.

- The Federal Government is a major buyer of FM.

- Special circumstances in federal and state government and certain other segments, such as public utilities, militate in favor of FM.

INPUT

c. Applications/Usage

- **Extensive Workloads and Personnel Shortages**--PSFM is a good alternative to in-house management when the applications are complex, numerous, or time-sensitive and the personnel are not in place to operate the facility (e.g., Federal Government).

3	3	3
+	+	+

- **Logical Extension of Contract**--systems integrators will find an increasing opportunity to offer FM at the conclusion of their contracts.

1	2	3
+	+	+

- **Expertise**--centers that are complex (e.g., large network applications) require a level of skills more available to the vendor than to the user.

4	3	2
+	+	0

- **Control**--a key issue is the desire of organizations to be in full control of their data centers. Comfort levels improve somewhat through time.

4	3	2
-	-	0

- **Market Changes**--new IS requirements brought on by business conditions may require rapid change in operations. An outside contractor offers quicker response.

3	3	3
+	+	+

INPUT

d. Technological Impact

- **Technical Changes**--PSFM vendors are
  better able to maintain fully-trained personnel
  that are up-to-date with the technology
  than the user.

3	3	3
+	+	+

- **Turnkey System**--as smaller systems are
  developed for more complex applications, the
  need to operate large, traditional data facilities
  may decline.

3	4	4
0	-	-

e. Software Impact

- **Applications and 4GL**--methodology advances
  in software promote PSFM vendor operation
  and maintenance on the one hand and negate
  the need on the other. Overall impact is neutral.

3	4	3
0	0	0

- **Distributed Data Base/Processing**--in large
  enterprises it is cost effective for vendors to
  operate these frequently geographically-
  dispersed facilities.

3	4	4
0	+	+

- **Systems Integration**--projects that involve
  operations that cannot be shut down while
  the development is going on require PSFM.
  The PSFM vendor supplies the extra personnel
  needed during the transition.

3	4	4
+	+	+

- **Software Development May be the Target
  Rather than Processing**--FM of "programming
  department" will gain significance.

1	2	2
+	+	+

INPUT

f. __Market Size and Growth__

Category: Professional Services - Facilities Management								
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	815	1027	8%	1109	1293	8%	1397	1831	7%
SE (Small)	100	126	8%	136	159	8%	171	225	7%
SUM (Total)	915	1153	8%	1245	1452	8%	1568	2056	7%
------Components------									
All	915	1153	8%						

g. __Marketplace__

    (1)   Marketplace Factors

- **Funding**--inability to fund equipment replace-
  ments, especially in the federal sector,
  encourages FM of obsolete equipment.

3	3	3
+	+	+

- **Competitive Intensity**--vendors are beginning
  to realize the potential of FM for account
  control.

1	2	2
0	+	+

    (2)   Marketshare Gains/Losses

- Professional Services Vendors

1	1	2
+	+	+

- Aerospace Firms

1	1	2
+	+	-

- Maintenance Firms

1	1	1
-	-	0

INPUT

PROFESSIONAL SERVICES - SYSTEMS INTEGRATION (1)

- **Growth Drivers**

  - **Move Toward Complex, Multivendor Systems**   4   4   3   +   +   +

  - **Business Urgency of Getting New Systems Implemented**   3   4   5   +   +   +

  - **Shortage of People and Skills In-House**   2   3   3   +   +   +

  - **Profound Process and Operational Changes are Entailed**   4   4   3   +   +   +

- **Growth Inhibitors**

  - **Control Issue is Important to User**   3   3   2   -   -   -

  - **Advanced Development and Management Tools Relieve Some of the Need**   2   3   4   -   -   -

  - **Publicized Failures (Assumed) and Overselling (Certain)**   4   4   2   -   -   -

6. PROFESSIONAL SERVICES - SYSTEMS INTEGRATION **(1)**

---

a. <u>Definition</u>

- Systems integration is the consolidation in the hands of a third party of "total solution" responsibility to a complex, multidisciplinary information systems requirement.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Primarily a LE market in the short to intermediate timeframe, but SEs will increasingly be served as time goes on. The ultimate users extend throughout the organizations as the systems that are developed are complex and far ranging. As such, systems integration activities are highly visible and tend to reach into the top levels of the organization. In fact, chief executives and their operations managers may be the first points of contact for the systems integration vendor.

- The overriding characteristics of the users are the felt need for the system and their sense of urgency.

(2) Buyer

- The buyer may be the board of directors, the chief executive, an operations vice president, or the director of IS. Often, the buyer will represent a task force or committee charged with the responsibility of developing the system and ensuring its operation. A critical aspect of the vendor-user relationship is transparency of other vendors who may be involved in the solution. One of the clients' motives is to avoid the multiple interfaces required in past projects.

INPUT

c. Applications/Usage

- **Basic, Core Business Applications**--targets
  are generally systems at the very heart of the
  enterprise. User is reluctant to go outside,
  a control issue.

3	3	2
-	-	-

- **Project Complexity**--projects typically cut
  across other in-place IS systems, are
  extensively vertical, involve multiple vendors,
  and are very complex.

4	4	3
+	+	+

- **Urgency of the Need**--to the extent that the
  application is critical to the cost/effectiveness,
  even survival, of the business, the need for
  a quick solution will be very important.

3	4	5
+	+	+

- **Availability/Expertise of In-House Staff**--
  staff sizes are not growing enough to meet
  the demand. Frequently the in-house staff
  does not have the expertise required to
  effect the solution.

2	3	3
+	+	+

- **Inter-Enterprise Business Practices**--
  as enterprises make more use of EDI,
  there will be a need to bring each enterprise
  up to the standards practiced.

1	3	4
+	+	+

- **Intra-Enterprise**--"islands of automation"
  need to be interconnected.

2	3	4
+	+	+

INPUT

- **Office Automation Systems**--work unit and corporate level OIS require the installation of supporting systems.

2	3	3
+	+	+

- **Departmental Computing**--the decentralization of some IS resources closer to the primary users requires major systems changes.

3	3	2
+	+	+

d. <u>Technological Impact*</u>

*Minority opinion: technology will be more routine and standardized by 1993-1997, requiring less SI, not more.

- **Voice/Data, Data/Text, Text/Image Integration**--the ability to communicate all types of media over a single line will require retrofitting IS equipment and software, creating opportunity for PS firms.

2	3	4
+	+	+

- **Micro-Mainframe Linkage**--there is a growing requirement for end users to access more powerful equipment, use remote peripherals, and make use of centrally stored resources.

2	3	4
+	+	+

- **Communications Network Integration**--intra- and inter-company networks also require the establishment of interfaces and extensive modification of existing systems.

3	4	3
+	+	+

INPUT

- **Process/Production Automation**--there is a
  need primarily in manufacturing to automate
  and connect various subsystems and devices
  (e.g., CIM).

4	4	3
+	+	+

- **Computer Hardware Enhancements**--
  changes in computer capabilities and
  architecture require system upgrades.

3	4	4
+	+	+

e. Software Impact

- **Distributed Data Base Management
  Systems**--implementation requires
  restructuring of large segments of
  existing IS.

3	4	2
+	+	+

- **Document Interchange Standards**--industry
  standards for documents are certain to increase
  beyond the primitive ones of today (e.g., ASCII).
  Implementation may be intense and far reaching.

1	3	2
0	+	+

- **Open Architecture**--this is essentially a set of
  standards for compatibility of IS systems.
  Implementation requires restructuring.

1	4	3
0	+	+

- **Development and Management Tools**--
  availability of advanced development
  and project management tools mitigate need
  for outside assistance.

2	3	4
-	-	-

INPUT

f.   Market Size and Growth

Category: Professional Services - Systems Integration								
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1362	3579	38%	4940	6995	19%	8324	14059	14%
SE (Small)	150	412	40%	576	900	25%	1125	2334	20%
SUM (Total)	1512	3991	38%	5516	7895	20%	9450	16393	15%
----Components----									
All	1512	3991	38%						

g.   Marketplace

    (1)   Marketplace Factors

- **Process Integration**--need extends beyond
  "systems" integration; requires core business
  process change and integration and
  outside assistance.

2	4	3
+	+	+

- **"Full-Service" Vendors**--these professional
  services vendors (e.g., CTG) can provide all
  of the components typical of SI projects and
  strengthen their long-term relationship
  with clients.

2	3	4
+	+	+

- **Publicized SI Project Failures**--the risks of SI
  failures are large. One or a few such failures could
  impede the market.

1	4	1
-	-	-

- **Claimed (versus Actual) SI Capabilities**--
  SI is a capability many vendors are claiming but
  few have. Claims may confuse the market and
  could lead to disappointment and failure.

4	3	2
-	-	0

INPUT

(2) Marketshare Gains/Losses

- IBM

3	4	4
+	+	+

- CSC

1	2	2
+	+	+

- EDS

2	3	4
+	+	+

- Arthur Andersen

3	4	4
+	+	+

- Other "Big 8" Firms

1	2	2
0	0	+

- Other PS Firms, Spinoffs, etc.

2	3	3
-	-	-

INPUT

PROCESSING SERVICES - BATCH PROCESSING (1)

- **Growth Drivers**

    - **Large Volume Paper Transaction Processing**   3   3   2
                              +   0   -

    - **Specialized Output Services (Laser, COM, Slides, etc.)**   4   3   2
                              +   +   +

    - **Disaster Recovery Services (Small but Growing)**   2   3   4
                              +   +   +

    - **General Business Applications for SEs**   2   3   2
                              +   +   0

- **Growth Inhibitors**

    - **Price/Performance Improvements in In-House Alternatives**   3   3   4
                              -     -   -

    - **Better Packaged and Turnkey Systems for SEs**   2   3   4
                              -     -   -

    - **EDI will Eventually Make Inroads into Client's Paper Load**   2   2   4
                              0   0   -

    - **Applications and Data Integration Needs Better Met On-Line or In-House**   3   4   5
                              -     -   -

7. PROCESSING SERVICES - BATCH PROCESSING **(1)**

---

a. <u>Definition</u>

- Computer processing, data entry, and computer-generated output, including microform and slides, that are carried out at vendors' sites utilizing programs owned by the vendor or user and user data physically taken to vendors' sites even if terminals, PCs, or other on-line equipment is used for data entry at the vendors' sites.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Departments of corporations or government organizations that are trying to escape long IS development cycles, procedural delays, high development or processing costs, or unresponsive IS organizations and procedures. Users may also want to utilize supercomputers to run complex technical work or special output equipment (e.g., COM, very high-speed printers) on a continuing or periodic basis. The latter (e.g., seasonal peaks) is a market driver. Special services such as disaster recovery and direct mail are included as batch services.

(2) Buyer

- Division and department executives buy, although IS executives or purchasing may have to approve the purchase. A coordinator may be appointed by IS to approve vendors and vendor invoices, particularly in larger enterprises. In very small enterprises, top management frequently is the buyer.

- Many SEs depend upon batch processing services for all or a major part of their accounting needs.

INPUT

c. Applications/Usage

- **Volume Processing Paper Transactions**--
  applications such as credit card slips, checks,
  order forms, mailings, etc. Characterized by
  large volume data entry and simple processing
  with rapid turnaround. Slowly diminishing.

3	3	2
+	0	-

- **Complex Technical Applications**--using
  large-scale computation capabilities (e.g., LP),
  especially supercomputers, later will move
  in-house or to RCS.

3	2	1
+	0	-

- **Specialized Output Processing**--laser
  printing, COM services, slides, very high speed
  printing/plotting. Dynamic utility processing
  moving in-house and sometimes back out again.

4	3	2
+	+	+

- **Disaster Recovery**--increased emphasis
  will grow this small market segment.

2	3	4
+	+	+

- **Capacity Services**--used for overflow peak
  period, processing, or periodic needs such
  as special projects.

2	2	2
0	-	-

- **Business Applications-Payroll, Accounting**--
  continues to flourish in SEs. Availability of
  national services inducing some LE vendors to
  buy services because cost is less than in-house.

2	3	2
+	+	0

INPUT

- **Industry-Specific Applications**--typically, smaller enterprises will shift to RCS or in-house as applications reach more into the core of the business.

4	3	2
+	0	-

- **New Business Formation**--influx of new companies creates need for business applications: payroll, accounting, cross-industry applications.

3	2	2
+	0	-

d. <u>Technological Impact</u>

- **Price/Performance Improvements**-- present use in LEs will be negatively impacted by improved in-house hardware and software.

3	3	4
-	-	-

- **New Technologies such as CD-ROM**-- services based on these new technologies will emerge while it is not cost effective to install in-house equipment; for example, marketing and reproduction of media.

2	3	3
+	+	+

- **Price/Performance Improvements**-- hardware and software at SE level, particularly for more powerful PC-based systems, enable small users to move in-house via packages and turnkey systems.

2	3	4
-	-	-

INPUT

- **Communications Changes**--lower costs of terminals (PCs), transmission, improved capabilities, and demand for on-line access to data will move work in-house or to RCS.

2	3	4
0	-	-

- **EDI**--electronification will remove need to process vast quantities of paper, reducing requirement for batch processing.

2	2	4
0	0	-

    e.   Software Impact

- **Package Availability**--availability of new software packages and migration of packages previously only on large computers to small ones will move applications in-house.

2	2	2
-	-	-

- **New Operating Systems**--multitasking, multi-user O/S for PCs will enable small enterprises to move work in-house inexpensively.

2	3	4
-	-	-

- **Software Interconnection and Data Base Distribution**--the need for applications integration and the supporting distribution of data and software will cause applications to move on-line and in-house.

3	4	5
-	-	-

- **CASE, Applications Generation**--improvement in software development, modification, and maintenance will remove barriers to going in-house.

2	3	3
-	-	-

INPUT

f. <u>Market Size and Growth</u>

Category: Processing Services - Batch Processing								
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1064	1267	6%	1343	1509	6%	1600	1600	0%
SE (Small)	2480	3124	8%	3374	3863	7%	4133	4652	3%
SUM (Total)	3544	4391	7%	4717	5372	7%	5733	6252	2%
------Components------									
Batch Services Industry Specific	1892	2398	5%						
Batch Services Cross-Industry	986	1282	7%						
Batch Utility Processing	666	711	2%						

g. <u>Marketplace</u>

(1) Marketplace Factors

- **Limited Competition**--competition for batch processing is strong but limited to a few vendors (e.g., ADP, Bank of America, Paychex in payroll).

3	4	4
+	+	+

- **Expansion-Geographic and Applications**-- vendors will expand geographically and diversify into related applications (e.g., Anacomp, Endata, ADP).

3	3	2
+	+	+

- **Product Transfer**--vendors will offer service at customers' sites through turnkey or user site hardware systems (including support of optical disk or EDI that is "partially" on-site).

2	3	4
-	-	-

INPUT

(2)   Marketshare Gains/Losses

- Batch Services Companies

2	2	2
+	0	-

- Banks

1	2	3
0	-	-

- Vertically-Oriented Service Companies

1	2	2
+	+	+

- Others

2	2	2
0	0	0

PROCESSING SERVICES - FACILITIES MANAGEMENT (1)

- Growth Drivers

  - Changes: Technology, Applications Requirements, Volume, Architecture, Company Structure   3+   3+   3+

  - Vendor's Economies of Scale, In-Place Networks, Skill Base   2+   4+   4+

  - Natural Evolution from Systems Integration Relationship   2+   3+   3+

- Growth Inhibitors

  - Control is Key, Even More so than in Professional Services FM   4-   5-   5-

  - Competing Alternatives Get Better; Improved Software Makes Operations Easier   2-   3-   3-

8. PROCESSING SERVICES - FACILITIES MANAGEMENT **(1)**

a. <u>Definition</u>

- The management of all or a major part of a user's data processing functions where the equipment belongs to the FM vendor and where under a contract for longer than one year.

b. <u>User/Buyer Characteristics</u>

(1) User

- Users are generally the functional department heads of financial, medical insurance, or other establishments. Federal organizations constitute a large percentage of FM users. A growing percentage of users during the planning period will be DP or IS coordinators "offloading" their data centers.

(2) Buyer

- Top management occasionally buys the service, especially in SEs, although department heads or IS managers, usually with the approval of the CFO and/or CEO, will be the buyers in larger establishments. IS is increasingly involved.

c. <u>Applications/Usage</u>

- **Industry Specific Integrated Systems**--
basis for need, particularly for medium-sized
organizations and units of LEs that have
complex, time-sensitive applications.

3	4	3
+	+	+

INPUT

- **Networks**--often organizations requiring strong network communications capability and implementation using in-house resources.

3	3	2
+	+	0

- **Natural Evolution from Systems Integration**--as a result of systems integration projects, operating responsibility may also devolve to the vendor through follow-on contracts.

2	3	3
+	+	+

- **Control**--key issue is the desire of organizations to control their own destiny, especially in critical core applications.

4	5	5
-	-	-

- **Customer's Market Changes**--continued rapid changes in the structure of industries and companies make IS activities difficult to plan, providing a powerful argument for using an outside service.

3	3	3
+	+	+

- **Cost of Computer/Communications Network Operation**--economies of scale derive to the vendor, especially for medium-sized enterprises.

2	4	4
+	+	+

   d.   Technological Impact

- **Complexity**--increasing complex technology environments will cause users to look for services to provide technology platform and/or applications platform for them.

4	3	3
+	+	+

- **Price/Performance Improvements**--hardware/ software improvements will address only part of the operational equation, generating pressure for turnkey and FM services.

3	3	2
+	+	0

e.   Software Impact

- **Applications Packages and 4GLs**--easily modifiable, state-of-the-art software packages, and professional services available with hardware will compete with FM.

2	3	3
-	-	-

- **Distributed Data Bases/Processing**-- integration of systems with end-user functions requires distribution of software, data, and processing, more easily provided by FM vendors.

2	4	4
+	+	+

- **Ease of Operation**--software which makes it easier to operate computer/communications networks tends to favor in-house IS.

2	3	3
-	-	-

f.　Market Size and Growth

Category: Processing Services - FM									
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	1666	2468	14%	2814	3657	14%	4169	7041	14%
SE (Small)	1100	1464	10%	1611	2167	16%	2514	4874	18%
SUM (Total)	2766	3932	12%	4424	5824	15%	6683	11915	16%
------Components------									
Industry Specific	2523	3640	13%						
Cross-Industry	62	66	2%						
Utility Processing	181	290	17%						

g.　Marketplace

　　(1)　Marketplace Factors

- **People**--scarcity of skilled people, taken up by very large enterprises and vendors, encourages FM.

3	2	2
+	+	0

- **Competitive Intensity**--more competition and visibility in this market as vendors recognize the value of FM in account control.

3	4	4
+	+	+

- **Federal Government Budget Limits**-- promote use of FM in place of large capital outlays.

3	2	1
+	+	0

INPUT

(2) Marketshare Gains/Losses

- IBM

2	3	3
+	+	+

- Other U.S. Computer Manufacturers

1	1	2
+	0	-

- Other FM Companies

2	1	1
+	0	0

- Systems Integrators

1	2	3
+	+	+

INPUT

TELECOMMUNICATIONS SERVICES - VANS (2)

- Growth Drivers

  - Improved Communications
    Technology Reduces Cost, Enhances
    Service

  - Widespread Adoption of EDI, Including
    International

  - "Fast Packet" Combined Services
    Feasible

  - AT&T and BOCs Continue to be
    Restrained by Regulatory Impedence

- Growth Inhibitors

  - Competition from RCS Vendors Looking
    to Offset Revenue Declines

  - Improved Local Applications Reduce
    Need for RCS via VANs

  - ISDN Provides Universal, Public
    Switched Services

  - Standards Lessen Need for Conversion
    Services

3 +	4 +	4 +
1 +	3 +	5 +
2 +	3 +	4 +
3 +	4 +	2 +
3 0	4 -	4 -
4 -	4 -	4 -
0 0	2 -	4 -
0 0	2 -	3 -

9. TELECOMMUNICATIONS SERVICES - VANs **(2)**

---

a. <u>Definition</u>

- VANs are publicly available, packet-switched networks offering dial-up or direct connections for customers. Although often confused with remote computing services (RCS), for definitional purposes all "processing" done by VANs is communications related: speed, protocol, and code conversions; error detection/correction; packet assembly/disassembly; and store and forward. This last category means that VANs support electronic mail functions. However, when E-mail documents are stored, this function becomes a remote computing service.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Users are the functional personnel requiring access to the services VANs link to or connections to other corporate offices. Accordingly, a wide variety of users are possible within corporations. Services can be of interest to enterprises of almost any size, but particularly to LEs and SEs with geographically dispersed operations.

(2) Buyer

- Decisions on what VAN to use are generally the telecom/datacom manager's, particularly for inter- and intra-company networking. However, users requiring specific services which are only available through a specific VAN (or its affiliated RCS) may also be the buyers. High-ranking selection criteria include cost, geographic coverage, and value-added features.

INPUT

c. Applications/Usage

- **Protocol Conversion**--protocol and file format conversions between company units, which is especially relevant to LEs.

3	2	1
+	+	+

- **Access to OLDBs**--emergence of CD-ROMs limits what would otherwise be a larger market to the volatile portion of data.

1	2	3
+	+	+

- **E-Mail Services**--universal, cross-system interchange.

2	3	4
+	+	+

- **EDI Services**--universal, structured E-mail for commercial transactions.

1	3	5
+	+	+

- **Videotex Access**--consumer-style on-line services relevant to business as well.

1	2	3
+	+	+

- **New Applications**--access to telecommuting and other applications yet to be devised.

0	3	5
0	+	+

- **Widespread EDI**--interchange standards adopted in many industries.

1	3	5
+	+	+

- **Global EDI**--global economy promotes expansion beyond national boundaries.

0	1	3
0	+	+

INPUT

Note: Use of VANs by SEs trends to be
intercompany while LEs tend to use both
inter- and intra-company services. "Virtual
Private Networks" will be of special interest
to small- and medium-sized firms.

d.   Technological Impact

- **Improved Technology**--improved, lower
  cost transmission and equipment provide
  better service. Examples are: optical fiber,
  improved satellite, local bypass, and greater
  network intelligence.

3	4	4
+	+	+

- **More Attractive Private Nets**--same
  technology promotes private in-house
  operated networks in larger companies.

3	4	4
-	-	-

- **Combined Voice/Data/Image**--"Fast
  Packet" techniques make combined services
  attractive and feasible.

2	3	4
+	+	+

- **ISDN**--development of ISDN by common
  carriers provide direct, universal interface
  for voice/data/image.

0	2	4
0	-	-

INPUT

e.　Software Impact

- **Improved Local Software**--cost-effective local applications reduce LE and SE need for RCS via VANs.

4	4	4
-	-	-

- **Virtual Private Networks**--improved security and network control software facilitates VPNs for LEs and larger SEs.

0	3	3
0	+	+

- **Standards**--standard communications and interchange software lessens need for conversion.

0	2	3
0	-	-

f.　Market Size and Growth

Category: Telecom Services - VANs

	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	259	543	28%	695	1001	20%	1201	2029	14%
SE (Small)	150	345	32%	455	700	24%	868	1572	16%
SUM (Total)	409	888	29%	1151	1701	22%	2070	3601	15%
------Components------									
All	409	888	29%						

INPUT

g. Marketplace

    (1) Marketplace Factors

- **Impact of Government Regulation**--
  will continue to restrain AT&T and BOCs
  from competing effectively.

3	4	2
+	+	+

- **Competition from RCS Vendors**--RCS
  vendors with specialized value-added services
  looking to offset declining RCS revenues
  will confuse market.

3	4	4
0	-	-

- **Private/Shared Networks**--networks
  developed by banks and others will need
  volume and will offer competition in specific
  industry sectors until they abort their efforts
  toward the end of the planning period.

3	2	1
-	-	0

    (2) Marketshare Gains/Losses

- Telenet

4	4	4
-	-	-

- Tymnet

3	3	3
-	-	-

- GEISCO

3	3	3
+	+	+

- CSC

3	4	4
+	+	+

INPUT

- IBM

3	3	4
+	+	+

- Compuserve

2	2	2
+	+	+

- Others

1	1	1
0	0	0

Note: All marketshares shown could be
impacted, probably adversely, by AT&T's
IDSN, depending on how and when
deployed and at what price.

INPUT

TELECOMMUNICATIONS SERVICES - REMOTE COMPUTING SERVICES (1)

- **Growth Drivers**

    - **EDI Activity Will Increase** | 2 + | 4 + | 4 + |

    - **Complex, Regulated Applications will Attract Users, Avoiding Mainte-nance and Risk** | 4 + | 4 + | 3 + |

    - **OLDB Services will Spawn New Related Applications** | 4 + | 4 + | 3 + |

    - **More Capable Application and Industry-Specific Products will Emerge** | 3 + | 4 + | 4 + |

- **Growth Inhibitors**

    - **In-House Control Remains a Key Deterent** | 4 - | 4 - | 4 - |

    - **Sum of Processing Plus Communi-cations Costs Keeps Price High Compared to Alternatives** | 5 - | 5 - | 5 - |

    - **Monthly Bill is a Plump Target for Alternatives** | 4 - | 4 - | 4 - |

10. TELECOMMUNICATIONS SERVICES - REMOTE COMPUTING SERVICES (RCS) **(1)**

<div style="border:1px solid black; padding:10px;">

a. <u>Definition</u>

- Remote computing services is a method of delivering information processing solutions to end users via workstations at the customer site that are connected by a data communications network to a vendor's computer center. RCS includes interactive timesharing and remote batch services.

</div>

b. <u>User/Buyer Characteristics</u>

    (1) User

- End users are functional personnel or functional departments using one-on-one or many-on-one applications or services offered by the vendor. In SEs the enterprise's total DP needs may be met via RCS. In some instances the user is a business user accessing the system from a home computer.

    (2) Buyer

- The buying decision is frequently at the user department level in LEs. In cases where the expenditure is large or involves hardware, the IS organization will be involved as an advisor. The LE buyer most often perceives he is buying an interim solution, but this may not be the case in SEs.

c. <u>Applications/Usage</u>

- **Personal Productivity Shifting to PCs**--
  most has already shifted and more will as more
  power becomes available at lower cost. The
  trend will have run its course by the end of the
  planning horizon.

4	3	1
-	-	0

INPUT

- **Shared Usage/Consolidation**--inherently shared, geographically diverse applications will continue to use RCS.

2	1	1
+	0	0

- **Supercomputer Problem Solving**--will grow as users become increasingly sophisticated and as fewer organizations want to support this type of service in-house.

2	3	3
+	+	+

- **EDI Activity will Increase**--as more services become available and as more LEs implement EDI, there will also be a pull-through of SEs.

2	4	4
+	+	+

- **Regulatory Changes will Feed Growth**--as users do not want to keep up or be at risk, they will use RCS for PR, HRS, ERISA, COBRA, etc.

4	4	3
+	+	+

- **On-Line Data Base Services**--will continue healthy growth and will spawn new applications as users become more information/ time sensitive.

4	4	3
+	+	+

- **Application/Industry-Specific Products**-- these will emerge in RCS and RCS FM and, for SEs, will be viable alternatives to their own DP shop.

3	4	4
+	+	+

- **Network Connectivity**--networking that works, unlike many internal attempts, will provide growth and potential new applications.

2	2	2
+	+	0

INPUT

- **Multinational Access**--to data and applications allows LEs to link offices and customers and is not readily replicable due to PTTs' cross-boundary complexity.

3	3	3
+	+	+

- **Buying Points**--will not often be at the departmental or end user level, allowing RCS to compete for "micro" applications.

3	2	2
+	+	+

d. <u>Technological Impact</u>

- **Multiuser PCs and LANs**--will migrate work from RCS to local solution, except where distance and networking is a factor.

2	4	1
-	-	0

- **Very High Performance PCs**--will continue to impact RCS applications except in those cases where the software is still not cost-effective at the desktop.

2	2	1
-	-	0

- **Scanning and Voice Data Entry**--these technologies offer potential cost reduction for more efficient data collection for many industries.

1	2	4
0	+	+

- **Very Low Cost Home Computers**--with predefined applications for home banking, shopping, etc. offer potential diversification.

1	2	4
0	0	+

- **Development of Private Networks**--in-house development will prove to be a failure for many industries for applications such as POS and ATMs, leaving the door open for RCS.

3	5	4
0	+	+

INPUT

e. Software Impact

- **Applications Software**--ready-to-go on RCS
  will benefit from difficulties at SEs and LE
  departments in achieving successful
  installation and operation of their own.

3	4	3
+	+	+

- **More Complex Systems Software on PCs**--
  products like UNIX will provide openings for
  RCS with their solution versus product orientation.

2	2	5
0	+	+

- **FGL Applications Development Tools**--will
  require "mainframe" systems and complex OS.
  Some users will want the tools without the
  hardware overhead and cost.

1	3	3
0	+	+

- **EDI Software Improvements**--standards,
  more intelligence in the network, and performance
  enhancements will be developed, and more
  companies will adopt.

2	3	4
+	+	+

- **Software Downsizing**--general availability
  of specialized software on smaller in-house
  systems will reduce RCS opportunities.

3	3	3
-	-	-

INPUT

f. **Market Size and Growth**

Category: Telecom Services - RCS									
		---Short term---		---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	4000	5471	11%	6072	6952	7%	7439	9042	5%
SE (Small)	4264	6153	13%	6952	8260	9%	9003	11802	7%
SUM (Total)	8264	11623	12%	13025	15212	8%	16442	20844	6%
------Components------									
Industry Specific	4414	6940	14%						
Cross-Industry	2300	3284	10%						
Utility Processing	1550	1899	7%						

g. **Marketplace**

    (1)   Marketplace Factors

- **Service and Support Win Customers--**
  RCS vendors could capitalize on their end-user and application knowledge. Since this is their second chance, they may learn.

2	4	2
+	+	+

- **Merger/Acquisition Activity--**will consolidate competitors and expand sales coverage. It will also create well-funded entreprenurial groups to compete in niche markets.

2	3	3
+	+	+

- **Vertical Market Concentration--**is necessary for RCS to capture industry or subindustry market positions in SEs. Also mandatory for application-specific niches in the LE arena.

2	3	3
+	+	+

INPUT

- **Horizontal Integration**--addition of other products and services within a vendor niche will offer the best growth strategy.

1	3	5
0	+	+

- **Small Local Service Vendors**--these have an opportunity to provide full service, including hardware, in SE markets; stability and continuity could be winning strategy.

1	1	3
0	0	+

- **In-House Control**--users continue to resist yielding control of vital applications and data.

4	4	4
-	-	-

- **Cost**--the sum of processing and communication costs plus vendor profit tends to keep RCS prices higher than in-house alternatives.

5	5	5
-	-	-

- **Price/Performance Improvements**--storage and mainframe price reductions and performance improvement drive down price structure, falling more rapidly in the marketplace than in the RCA vendor's shop, thus squeezing margins.

3	3	3
-	-	-

- **Others Attack Processing Services Clients**-- computer manufacturers, turnkey system vendors, and software product companies all see monthly RCS bills as prime, plump targets.

4	4	4
-	-	-

INPUT

(2) Marketshare Gains/Losses

- ADP

3	3	3
+	+	+

- GEISCO

3	2	2
-	0	0

- McDonnell Douglas and other Spinoffs

4	4	3
-	-	-

- CCH Computax (Possible Sleeper)

3	3	2
+	+	0

- First Data Resources

3	2	2
+	0	0

- Shared Medical

3	3	2
+	+	0

- Compuserve (Possible Sleeper)

4	4	4
+	+	+

- NDC

3	2	2
0	0	0

- MTech

2	3	2
0	+	0

- IBM

1	2	3
+	+	+

TELECOMMUNICATIONS SERVICES - ON-LINE DATA BASE SERVICES (1)

- Growth Drivers

  - Increasing Need for Dynamic Data, Automatic Accessing   5+   4+   4+

  - Lower-Cost Workstations   2+   3+   4+

  - Knowledge-Based Access Assistance Software   10   3+   5+

  - Gradually Increasing Home Use   10   3+   4+

- Growth Inhibitors

  - CD ROM Impact, Especially on Static Data   10   2-   3-

  - Conservative Nature of Dominant Providers/Owners   30   4-   5-

  - Site Gateway Accessing will Reduce Potential Revenues   1-   3-   5-

11. TELECOMMUNICATIONS SERVICES - ON-LINE DATA BASE SERVICES **(1)**

a. <u>Definition</u>

- On-line data base services are provided to end users via workstations connected by a data communications network to the vendor's computer and data base. The service is characterized by the retrieval and processing of information owned either by the vendor or a third-party provider.

b. <u>User/Buyer Characteristics</u>

(1) User

- End users are individual functional personnel or departments that use common information. Individuals accessing data bases for business use from their home are also users. In LEs users tend to be professionals and functional specialists in research and planning areas. In SEs users can include operating and top management people in pursuit of decision support information.

(2) Buyer

- The home buying decision is personal and most often influenced by references from friends or associates. The business or institutional buyer is most often the end user or the manager of the functional area responsible for using the data. In LEs, buyers tend to be functionally specialized; in SEs virtually anyone in an analytical or decision-making role could be a purchaser.

c. <u>Applications/Usage</u>

- **Electronic Access to Static Information**-- static data bases are historical or reference type data; these will be impacted by CD ROM and other technology.

3	2	1
0	-	-

INPUT

- **Electronic Access to Dynamic Information**--
dynamic data bases are more real time, requiring
frequent updating and containing more "live" data.

5	4	4
+	+	+

- **"Automatic" Access to Dynamic Data Base**--
parameter driven program to trigger access from
the user's computer to an on-line service for the
most current data.

3	5	5
0	+	+

- **Home Access**--as applications develop,
like airline reservations and ticketing, that
easily allow users to do more than "browse,"
home use will increase.

1	3	4
0	+	+

d. <u>Technological Impact</u>

- **CD ROM Data Bases**--CD ROM can replace
data base services, particularly in the static/
reference environment.

1	2	3
0	-	-

- **Larger Workstation Storage and Processing
Speed**--many data bases and subsets could
be downloaded to a user's local system, given
development of low-cost, high-speed modems.
A negative at first, will open new opportunities
in long run.

2	3	3
0	-	+

- **Voice Data Input**--voice-activated queries will
impact specific segments such as credit/check
authorization.

1	3	3
0	+	+

INPUT

- **Lower Cost Workstations/PCs**--more PCs at home and business will mean more access points for OLDB services.

2	3	4
+	+	+

- **Site Data Access Gateway Technology**-- allows accessing information once and then makes it available to many users within the organization. This is also a billing/licensing issue.

1	3	5
-	-	-

e.   <u>Software Impact</u>

- **Knowledge-Based Systems**--will assist the user through an interface that "automatically" finds the appropriate data for the user's problem.

1	3	5
0	+	+

- **Protocol Conversion/Gateway Software**--will make usage more transparent and encourage use of the service.

1	2	3
0	+	+

- **Network/Communications Standards**--will lessen the need for conversion software and make the gateway network more useable.

1	2	4
-	0	+

- **Security Software and Systems**--are needed now to protect from fraud and misuse. Will happen more rapidly as a catastrophe materializes.

1	3	4
0	-	-

INPUT

f. Market Size and Growth

Category: Telecom Services - On-Line DB Services								
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	2194	3605	18%	4254	5823	17%	6813	11506	14%
SE (Small)	1000	1728	20%	2074	2986	20%	3583	6947	18%
SUM (Total)	3194	5333	19%	6327	8809	18%	10396	18453	15%
-----Components-----									
Industry Specific	2308	3561	17%						
Cross-Industry	886	1772	26%						

g. Marketplace

(1) Marketplace Factors

- **Fragmented Market**--each must be treated separately by type of service and type of customer/ industry. Vendors will specialize and vertically integrate services.

5	5	5
-	0	+

- **Data Owners/Providers**--will become more powerful at expense of the service deliverers, especially as alternate markets are identified for their data.

2	4	5
0	+	+

- **CD ROM Pricing Impact**--static DB services will reduce prices to compete.

2	2	2
0	0	+

- **Traditional Vendors Entrenched**--few new vendors will penetrate these markets. Current vendors will dominate, particularly where they own the data.

3	4	5
0	-	-

INPUT

- **Rate of Adoption**--better user interface and alternative services such as CD ROM will be accelerated to a point of saturation, causing a shakeout.

3	3	5
+	+	-

    (2)   Marketshare Gains/Losses

- Quotron (will expand in more segments and gain share of total OLDB)

3	2	2
+	0	0

- Telerate

3	2	2
+	0	0

- Mead Data Central

3	2	1
-	-	-

- TRW

2	3	3
0	+	+

- Dun & Bradstreet (someone will compete for business credit)

4	3	2
+	+	0

- ADP (will continue to grow OLDB business)

2	3	3
+	+	+

- Dow Jones

3	2	2
+	+	0

- OCLC (impact from CD ROM)

4	3	2
0	-	-

INPUT

- Lockheed Dialog (historically not market responsive)

3	2	1
0	-	-

- Plus Many Others (and room for new data and new services)

1	2	3
+	+	+

INPUT

FINANCIAL SERVICES (3)

- **Growth Drivers**

  - **Drive Toward Large, Integrated Systems** — 1 +   3 +   4 +

  - **Financing Used as a Creative Marketing Tool** — 2 0   3 +   3 +

  - **Growth in Working Capital Needs** — 2 +   3 +   4 +

  - **Dampening of Technological "Waves" Toward end of Period, Improving Residual Values** — 1 0   3 +   4 +

- **Growth Inhibitors**

  - **Rapid Obsolescence (Somewhat Mitigated Toward end of Planning Period)** — 4 -   2 0   1 +

  - **Alternative Credit at Lower Rates through "Regular" Channels** — 3 -   3 -   3 -

12. FINANCIAL SERVICES **(3)**

<div style="border:1px solid">

a. <u>Definition</u>

- Financial services--rental, lease, and installment purchase financing coincident with acquisition of information systems products and services as an alternative to outright sale.

</div>

b. <u>User/Buyer Characteristics</u>

(1) User

- End-user concern with financing is roughly inversely proportional to size of enterprise where, at smaller end of the spectrum, user and buyer may be synonymous. "Try and buy" and short-term rental plans may have market appeal, especially at the PC level.

(2) Buyer

- Financing is a major consideration with small firms. Rental is normally prohibitively expensive with lease/purchase, lease, and installment purchase favored in that order.

- All-inclusive financing is an attractive feature of turnkey system offerings at the low end.

- Third-party financing may substitute for vendor financing, particularly in the case of larger systems.

INPUT

- In LEs, financing influences are the IS executive and the financial chain of command. As rental-purchase ratios have shifted adversely over the years, rental has ceased to be a major mode of procurement. Rapid obsolescense has also kept prices high on operating leases, leaving purchase or sale-lease as the predominant alternatives for buyers. Software financing, particularly on the mainframe side, is growing.

  c. <u>Applications/Usage</u>

- **Slower Growth in Traditional Large Systems**--fewer "mainframes" at lower per unit prices diminish financing opportunity growth.

2	3	3
-	-	-

- **Complex Systems**--strategic, complex systems consisting of hardware, software, communications equipment, and value-added professional services begin to resemble single-ticket purchases.

1	3	4
+	+	+

- **"Credit Crunch"**--general U.S. recapitalization needs could impact credit availability.

1	2	3
0	-	-

- **Creative Financing**--increasing credit needs of customers of all sizes drives creation of innovative new financial plans.

2	3	3
0	+	+

- **Sales Tool**--financial services are being used increasingly as a marketing tool for upscale systems, migrating slowly down to interme- diate systems.

2	2	3
+	+	+

INPUT

- **Use of Alternate Credit at Lower Rates**-- standard debt and equity financing means may be less expensive.

3	3	3
-	-	-

d. <u>Technological Impact</u>

- **Longer Writeoffs**--current tax law changes favor lease and rental.

3	3	3
+	+	+

- **Working Capital Needs**--large, complex, "strategic" systems strain companies' capital resources.

2	3	4
+	+	+

- **Rapid Obsolescence**--makes ownership riskier for buyers and vendors alike. Somewhat mitigated toward the end of the planning period.

4	2	1
-	0	+

- **Open Systems**--eventual stable hardware standards, open architecture will slow obsolescence, increasing residual values.

1	2	3
0	0	+

- **Resale**--the above will promote more active resale market in "hand-me-down fashion" within LEs and from LEs to SEs. Overall effect will be positive.

1	2	3
+	+	+

e. <u>Software Impact</u>

- **Obsolescence**--technological obsolescence factors are exacerbated by successive "waves" of new software, which should diminish by the end of period.

4	3	1
-	-	0

INPUT

- **Standards**--widespread, stable standards for program, data, interface, and communications will dampen "wave" factor (above).

1	3	5
0	+	+

- **Low-End Stabilization**--wave-dampening will be especially noticeable at the presently turbulent low end, encouraging more prevelant and attractive financing for smaller systems.

1	3	4
0	+	+

f. Market Size and Growth

Category: Financial Services	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	3240	3969	7%	4247	5046	9%	5500	8052	10%
SE (Small)	3150	4079	9%	4446	5479	11%	6081	9569	12%
SUM (Total)	6390	8048	8%	8693	10524	10%	11581	17621	11%

g. Marketplace

(1) Marketplace Factors

- **Large Systems/Large Enterprises**--big purchases by large, credit-worthy companies drive the present market.

3	2	1
+	+	0

- **Other Systems**--large, comprehensive office automation, LAN-based, and department processing systems will be a market stimulus later in the period.

2	4	4
+	+	+

INPUT

- **Systems Integration**--CIM, strategic information networks and other complex "electronification" will become important financing opportunities.

1	3	5
0	+	+

    (2)   Marketshare Gains/Losses

- Manufacturers

2	3	4
0	+	+

- Third Parties (leasing companies, banks, insurance companies, etc.)

4	3	2
0	-	-

- IBM

2	3	3
+	+	+

INPUT

OTHER DP SERVICES (2)

- **Growth Drivers**

    - **Applications-Specific Videotex Information**   3   4   4
             +   +   +

    - **Unstructured Information Extended to Employees, Customers, the Public**   2   3   4
             +   +   +

    - **Consumer Services Emerge**   2   3   3
             +   +   +

    - **Improved Technology Lower Costs**   2   3   3
             +   +   +

- **Growth Inhibitors**

    - **Vendors Unwilling to Step up to the French Model**   3   2   1
             -    -   0

    - **Complexity and Cost Remain Inhibiting Factors**   4   3   2
             -    -   -

13. OTHER DP SERVICES **(2)**

---

a. <u>Definition</u>

- Other DP services include videotex and consumer services, such as home banking, airline reservation systems, home shopping, etc., used essentially for business purposes. The information is usually unstructured and receiver-independent.

---

b. <u>User/Buyer Characteristics</u>

(1) User

- Users can be individuals or departments of a company from the sales/contact department which is using videotex to obtain orders or instructions from customers or a maintenance department that is selecting information for engineers to a human resources department that is answering questions for an employee via a kiosk in the lunchroom.

(2) Buyer

- Buyers are individuals or committees consisting of department heads and IS with the approval of top management. IS executives will be the lead buyers, but it will become even more necessary to sell user executives than IS to obtain this business during the next 10 years.

c. <u>Applications/Usage</u>

- **General Employee Information**--HR information, new policies, opportunities, new product information; unstructured information for employees replaces paper.

2	3	3
+	+	+

INPUT

- **Application-Specific Information**--selected
  information to work groups (e.g., competitive,
  financial, new products, market intelligence
  systems, etc.).

3	4	4
+	+	+

- **Inter-Organization Information**--unstructured
  information on availability, product/service
  characteristics, features, etc., for dealers,
  customers.

2	3	4
+	+	+

- **Consumer Services**--home banking, travel
  planning, shopping, etc. are emerging
  applications.

2	3	3
+	+	+

   d.   Technological Impact

- **Price/Performance Improvements**--
  lower costs of interconnections as well as
  expanded graphics capability at
  workstations and use of CD ROM for
  static information, etc.

2	3	3
+	+	+

- **Overlap with OLDB**--difference with on-line
  data base market is not great. GEISCO and
  others are providing unstructured information
  services, too.

1	1	2
0	0	0

- **Proliferation of Target Outlets and Users**--
  the market will eventually be reached, and it
  is potentially very, very large.

1	2	3
0	+	+

INPUT

e. Software Impact

- **New Operating Environments**--new O/S
  will allow videotex distribution as information
  service in background. Videotex does not
  replace electronic mail; it cohabitates
  with it.

2	3	3
+	+	+

- **Interconnection/Interface Software**--allows
  information from videotex and other internal/
  external information sources to be integrated
  into applications.

2	3	3
+	+	+

f. Market Size and Growth

Category: Other DP Services	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	380	563	14%	642	864	16%	1002	2009	19%
SE (Small)	50	86	20%	104	144	18%	170	377	22%
SUM (Total)	430	649	15%	745	1008	16%	1172	2386	19%
------Components------									
All	430	649	15%						

g. Marketplace

(1) Marketplace Factors

- **Vendor Confusion for Consumers**--no vendor
  as yet willing to step up to French model. All
  waiting for critical mass to be established.

3	2	1
-	-	0

- 244 -

- **RCS Vendors in Business Market**--vendors such as Compuserve and The Source will continue to have some success in home/business market.

2	3	4
0	+	+

- **Complexity and Cost**--these are still stumbling blocks from the end user's point of view.

4	3	2
-	-	-

- **In-House Videotex**--primarily a software sale, perhaps tied in to a network. There is little demand as yet, but some will develop as hardware, software, and communications costs come down.

3	2	1
-	0	+

- **External Information Suppliers**--application-specific information, "paper-based" vendors (McGraw Hill, D&B, etc.) will employ videotex along with CD ROM as a delivery medium.

1	2	3
0	+	+

    (2)   Marketshare Gains/Losses

- Compuserve

2	3	2
+	+	+

- Home Shopping Network

3	2	1
+	0	-

- Publishers (e.g., McGraw Hill, D&B, CBS)

2	3	4
+	+	+

- Telecommunications Companies

2	1	3
+	0	-

INPUT

TURNKEY SYSTEMS MARKET

- Not Included, As Such, in Data Base

- Substantial Overlap with Other Categories

- But Worth a View from its Unique Perspective

14. TURNKEY SYSTEMS

---

a. __Definition__

- A turnkey system is an integration of systems and applications software with CPU hardware and peripherals, packaged as a single applications solution. The value added by the vendor is primarily in the software and support. Most CAD/CAM/CAE systems and many small business systems are turnkey systems.

---

b. __User/Buyer Characteristics__

    (1)   User

- In the small enterprise the user has a set of application needs and buys a turnkey solution. The system solves the majority of requirements and allows "instantaneous" use of the applications. The user justifies the turnkey solution in hard dollars with some consideration of intangibles.

  In the large enterprise the user usually has need of one focused application which is addressed by the turnkey vendor. The user normally is in a function separable from the main IS stream, such as design engineering in a manufacturer or trust services in a bank.

    (2)   Buyer

- Turnkey solutions will be reviewed by senior management and the IS manager (if not the one recommending the procurement) in a large enterprise. Since most turnkey solutions have a major impact on the business, senior management is the buyer in small enterprises.

271

c. Applications/Usage

- **Complete "Packaged" Solution**--allows users to take advantage of computer technology to obtain productivity improvements or competitive advantage.

3	4	4
+	+	+

- **Industry-Specific Approach**--focused on applications with high/fast payoff.

3	4	5
+	+	+

- **Primary Use by SEs and Autonomous Departments**

3	3	3
+	+	+

- **Buyer is Looking to Simplify Acquisition and Support**--single source solution.

2	3	4
+	+	+

- **Problems of Integration with Other Activities**--may contribute to "islands of automation" syndrome.

3	3	2
-	-	-

- **Users Do Not Want to Build IS Bureaucracy**--especially true for SEs.

3	3	3
+	+	+

d. Technological Impact

- **New Hardware**--capacity/performance/ functionality, faster microprocessors, additional I/O devices; e.g., scanners, portable data entry, optical disk - more to worry about.

3	4	4
+	+	+

- **Standards**--de facto and/or negotiated may deemphasize creativity and application flexibility, make it tougher to provide value.

2	4	3
0	-	-

INPUT

- **Communication Tools**--LANs, satellite, fiber optics allow more integrated applications to be developed - create more need.

3	4	5
+	+	+

e. <u>Software Impact</u>

- **New Operating Systems**--provides opportunity to develop more value-added applications; e.g., on-line transaction-oriented RDBMS.

3	4	4
+	+	+

- **Distributed Relational Data Bases/4GL**-- provide enhanced development environment to provide more value to clients.

3	4	4
+	+	+

- **Integrated Application Development**-- will require more skilled personnel impeding product supply.

3	3	4
-	-	-

- **Applications Development Aids for Non-Professionals**--will make in-house development easier.

2	3	3
-	-	-

INPUT

f. <u>Market Size and Growth</u>

Category: Turnkey Systems									
	---Short term---			---Intermediate---			----Long term----		
	($M) 1986	($M) 1989	AAGR 86-89	($M) 1990	($M) 1992	AAGR 90-92	($M) 1993	($M) 1997	AAGR 93-97
LE (Large)	2870	4716	18%	5564	7880	19%	9377	18179	18%
SE (Small)	5330	8757	18%	10334	14634	19%	17414	33762	18%
SUM (Total)	8200	13473	18%	15898	22513	19%	26791	51941	18%

----Components---------------------------------

Hardware	3280
Value-Added Software	4346
Support Services	574

Note:
Hardware as a percentage of the system is declining. Software is increasing in value. Support is becoming increasingly important in providing training, 1st year maintenance/consulting and service.

g. <u>Marketplace</u>

(1) Marketplace Factors

- **Additional Small Firms will Emerge to Offer "Solutions" to the More Complex Environment**--this will be an increasingly important channel.

3	4	5
+	+	+

- **Integrated Application Development Tools**--will make it easier for new companies to form and target markets.

3	4	5
+	+	+

- **Existing Companies**--will become more dominant, leveraging their presence.

3	4	5
0	+	+

INPUT

- **Consulting/Custom Requirements**--
  will slow down selling "copies" and require more
  upfront sales/consulting.

3	3	3
-	-	-

- **Service will Become a Major Differentiation
  Point**--users need it.

3	4	2
+	+	0

- **Potential Prospects/Customers**--are
  becoming more aware of automation opportunities
  and feel a need for them.

3	4	5
+	+	+

- **Splinter Groups will be Spawned from
  Large Corporations**--to approach a particular
  market segment with an application developed
  in-house (to defray exense and be a new
  business).

3	3	3
+	+	+

- **Proprietary Hardware**--will shift to off-the-shelf
  systems from a few key suppliers.

2	3	3
+	+	+

- **Market Standards**--new application areas/
  methodologies (e.g., EDI) force many companies
  into instant need.

3	4	5
+	+	+

- **Poor Pricing has Impacted Vendor
  Viability**--have not charged enough for
  value added.

5	3	2
-	-	-

- **Increasing Shifts to Continuous Revenues**--
  only vendor can maintain software.

2	3	4
0	+	+

- **Some Markets Oversupplied**--e.g., legal,
  medical.

5	4	3
-	-	-

INPUT

(2)   Marketshare Gains/Losses

- Hardware companies (e.g., IBM, DEC)

2	3	4
0	+	+

- Major CAD/CAM/CAE vendors (e.g., Computervision)

2	2	2
-	-	-

- National vertically-oriented vendors (e.g., ASK, R&R)

2	3	4
+	+	+

- DP service companies (e.g., ADP, EDS)

2	3	4
0	+	+

- Other local and regional VARs

2	3	4
0	-	-

INPUT

IMPLICATIONS FOR IBM

INPUT

DEMAND FACTORS

- Impact Of Environmental Factors On Plans

    - Steady, Unspectacular Growth Of Expenditures For Systems Related To Physical Automation: Manufacturing, Transportation

    - Basic, Strong Demand For Systems To:

        . Amplify/Replace Skills Of Lower Tier Workers

        . Support Increasingly Stressed Upper Tier Workers

        . Initially Support Then Replace Professionals

    - Potentially Very Large Demand For Systems That:

        . Address New Applications

        . Change Organizational Structures

DEMAND FACTORS (Cont'd.)

- **Plan On Growth**

    - **We Are Not In A Mature Industry**

    - **Have Hardly Touched The Surface Of What Is Possible**

    - **Electronification Has 100 Years Ahead Of It**

    - **"Office" As A Communications Function Wastes More Money Each Year Than Is Spent on I.S.**

    - **Productivity Comes From Reducing Office Expenses**

- **Emphasis Must Be On Connectivity For Next 5 To 10 Years**

    - **Parts Of A System Must Work Together Effectively**

    - **Architectures Must Be Translated Into Reality**

    - **"Standards" Are A Two-Edged Sword; Timing In Their Use Is Critical**

INPUT

CUSTOMER ISSUES

- Who Is The Customer?

    - Smaller Enterprises Have More Potential For Growth Since They Are Less Penetrated

    - The Customer Is Increasingly A Mixed Group, With Balance Of Power Shifting Toward Periphery, Away From I.S.

    - As You Move Away From Central There Is Less IBM Orientation So IBM Must Work Harder

    - Two-Pronged Selling:

        . Centrally For Qualification Of Distributed Systems And Outright Central Sales

        . Distributed To End Users/Departments For Qualified Systems

- Customer Management Is Critical:

    - Requires IBM As The Customer Interface, Not Third Party

    - Shows Understanding Of Customer Needs

INPUT

CUSTOMER ISSUES (Cont'd.)

- IBM Needs Products And Services For The Small Establishment

    - Integration Of Communications, Computers, And Office Systems

    - Most People In Large Enterprises Are In Small Establishments Either "Real" Or "Virtual" (Autonomous Departments)

- Customers Want Solutions That Pay Off

    - Demonstrate Productivity Improvements

    - Assemble The Parts For Customers

    - Producing "Solutions" Requires Industry Knowledge

- IBM Must Address The Absorption Problem

    - Emphasize Education And Training Need

    - Make Systems Easier To Implement And Use

    - Provide Skills And Tools To Make It Happen

- Promote Performance

    - We Are All Becoming "Speed Freaks"

INPUT

COMPETITION

- **Contracts For Completely New Systems Opens Up Competition**

    - **Less "Drag-Along" From Installed Application Base**

    - **Systems Integrators Reduce Customer's Risk, So Non-IBM Systems Are Less Disadvantaged**

    - **This Implies IBM's Customer Base Is More Vulnerable**

- **IBM Must Be More Competitive Now:**

    - **Telecommunications Companies Are Struggling With New Environment, But Emerging**

    - **EDS Has To Digest GM**

    - **Other Equipment Companies Are Faced With Same Issues**

    - **Services Companies Are About To Break Through Into "Big Time"**

COMPETITION (Cont'd.)

- **Growth And Control Shifting To Non-Traditional Products And Services, So IBM Should Emphasize These**

    - **Exception Is Systems Software Which Is Key Controlling Factor**

    - **Traditional Products Increasingly Sold To And Through Companies On Services Side**

- **Look Out For Telecommunications Companies**

    - **Networks Are The Future**

    - **Telephone Systems Can Be "Trojan Horses"**

    - **They Are Already Selling Solutions**

MARKETS

- **Defend Traditional Product Markets Aggressively:**

  - **Pricing: Emphasize Price/Performance**

  - **Use Software/Firmware Boundary For Protection**

  - **Do Not Use Open Systems Except When In Catch-Up Mode--Then Close Them**

  - **Reduce Prices: Translate Manufacturing Efficiencies To Market**

- **Be An Innovator**

- **Attract Non-Traditional Markets**

  - **Supercomputers**

  - **Industry Personal Systems (Workstations)**

  - **Software: Systems, Tools, And Applications**

  - **Professional Services**

  - **Telecommunications, Especially Office Systems**

  - **Systems Integration At All Levels**

INTERNALLY

- **Present Problems Had Genesis 10 Years Ago:**

    - **Emphasis On Anti-Trust Led To Legal/Financial Domination Of Company Thinking, Not Market**

    - **Product Groups Went Off In Own Directions, Just When The Need Was The Opposite**

    - **IBM Must Reorient To Market Thinking And Integrated Product Line**

- **Traditional IBM Approach Is To Find "General" Solution To A Problem**

    - **Competitors Are Increasingly Providing Specialized Solutions--Which Customers Want**

    - **Generalized Solutions Often Take Too Long And Are Too Cumbersome**

    - **Implication Is More, Faster--Produce Customized Solutions**

- **Cut The "Fat"--Reduce The Office Overhead**

    - **Enable Manufacturing (Hardware And Software) Efficiencies To Be Translated Into Price Cuts**

    - **Show How It's Done**

    - **Address The "GM Problem"--Recognize That Ross Perot Was Right**

INPUT

INTERNALLY (Cont'd.)

- Value Added Is In The Solution. Therefore, IBM's Field Force Must Be Reoriented To Emphasize:

  - Problem Solving Capability

  - Technical Prowess

  - Industry Know-How

  - Project Management Skills

  - Ability To Integrate Third Parties Where Appropriate

- Main Implication Is That IBM Must Offer A Spectrum Of Products And Services Which Are:

  - Based On Standard Assemblies/Components

  - Flexible, Can Be Assembled In Different Ways

  - Address What Customers Need; i.e., Specialized

INPUT

IMPLICATIONS FOR IBM CUSTOMERS

- Talk Of "Maturity" And "Saturation" Reflects A Fear Of Progress And Is An Excuse For Poor Or Non-Performance

- By And Large, All Present Generation Systems Must Be Replaced

  - "Strategic" Mission-Critical Systems Are Competitive Necessity

  - Functions And Data Will Move Out To The Periphery

  - Changing Role And Balance Of Power For I.S.

  - Must Show Productivity Improvements, Attack Large Potential Payoffs First

- Because Of Urgency, High Risk, Complexity, And Intimacy With Core Business, I.S. Can't Gamble Or Delay

  - More Responsibility To Operating Personnel

  - More Responsibility To Outside Contractors, Vendors

IMPLICATIONS FOR IBM CUSTOMERS (Cont'd.)

- Treat Information Processing As A "Process" Not A Series Of Discrete Activities

- Mixed Vendor Solutions Look Preferable--No One Vendor Can Provide Everything

- Must Be Prepared To Pay For Added Values And Responsibilities

- I.S. Must Be Part Of All Operations And Planning--It Is Part Of The Process Of Doing Business

INPUT

IMPLICATIONS FOR COMPETITORS

- Increasing Standardization Will Commoditize More And More Of The Hardware Business, Squeezing Margins

- Viability Will Depend On Marketing Process, Account Control, And Value Added (Little Of Which Can Be Achieved Through Third Party Channels)

- Only The Strongest Will Survive

- Premiums On Direct Sales And Support, Application/ Industry Solutions Orientation

- IBM Will Fight Back <u>Hard</u>, Leaving Very Few Areas Of Vulnerability And Capitalizing On Its Strengths

- Hot Hardware And A Handshake Won't Cut It

RECOMMENDATIONS TO IBM

BROAD RECOMMENDATIONS

- Switch From A Function To A Customer Orientation

- Switch From Product To Service Emphasis

- Except For Systems Software, IBM's Traditional
  Markets In The U.S. Are Destined To Grow At 10% Per
  Annum Or Less. Therefore:

  - Increase Emphasis On Software And Services
    Components, Growth Of Which Will Remain In
    Double Digits

  - Emphasize Continuing Revenues, Not Outright Sales

- Take Responsibility For:

  - Development

  - Operation

  - Delivery Channel

- Reorient R&D Budget

  - 25% Or Less On Hardware

  - 25% Or Less On Technology

  - 25% Delivery Mechanisms: Systems, Networks,
    Tools

  - 25% Or More Software Applications

YSAS 5/5/87 P7-2

IBM PROPRIETARY

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BROAD RECOMMENDATIONS (Cont'd.)

- **Move From Generalized To Specialized Orientation; i.e., Create Specialized, Tuned Operating Environments**

- **Emphasize Connectivity**

- **Streamline**

  - **Get Rid Of Paper And Bureaucracy**

  - **Don't Be "Shoemaker's Children"**

- **Speed Up All Processes**

- **Get Rid Of Lawyers**

- **Attack The Office Environment**

  - **Change The Process**

  - **Integrate Communications With Information Systems**

- **Get Into The Extended Telephone Business Aggressively**

  - **This Is The Soft Underbelly Of Distributed Systems**

INPUT

BROAD RECOMMENDATIONS (Cont'd.)

- Instead Of Using Others To Sell IBM Products, Use IBM Distribution Capability To Sell Others

- Reorient IBM Marketing And Sales

  - More Effective Use Of People

  - Telesales/Telemarketing/Direct Mail

- Recognize That Buyers Are People--Get Back The Personal Touch

- Reduce Prices Substantially In Commodity Areas--Increase In Value Areas

IMPLEMENTATION SUGGESTIONS

- Cut All Architectures Except 370/XA And PC Out Of The Mainline LE Effort; i.e., Rationalize Product Line

- Confine All Others To Specialty Arenas; e.g., S/36 For SE, RT For Engineering, SI For Communications And Factory Floor, Etc.

- Continue To Develop And Support Communications, Data, Document And Applications Interchange Through Standard Protocols Among All Products: IBM Standards Not "Industry" Standard

- Get Into The Applications Software And Solution Business In A Big(ger) Way

- Increase Vertical Alignments Of The Field Organization

- Increase Emphasis On FSD And CSO--Examples Of Success Of Strategy (?)

- Consider The Information Business Itself Via OLDB Services And CD-ROM

- Continue Manufacturing "Commodity" Products Only Where The Capital Required To Stay Competitive Can't Be Even More Profitably Employed Elsewhere

- Resolve The Standards Issue Not By Opening The Box But By Defining Interfaces

INPUT

SUMMARY DATA BASE

```
          -----Short term------Intermediate term--------Long term-----
1 - Large Systems

        1986   1989  86-89   1990   1992  90-92   1993   1997  93-97
        ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large   4550   5732    8%    6190   7220    8%    7798  11417   10%
Small   1140   1476    9%    1609   1912    9%    2084   3051   10%
------------------------------------------------------------------
Total   5690   7208    8%    7799   9132    8%    9882  14468   10%

2 - Intermediate Systems

        1986   1989  86-89   1990   1992  90-92   1993   1997  93-97
        ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large  11050  13920    8%   15033  17861    9%   19469  28504   10%
Small   5945   7699    9%    8392  10340   11%   11477  18059   12%
------------------------------------------------------------------
Total  16995  21619    8%   23425  28201   10%   30946  46563   11%

3 - Small Systems

        1986   1989  86-89   1990   1992  90-92   1993   1997  93-97
        ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large   2285   3041   10%    3345   4348   14%    4956   7524   11%
Small   1865   2482   10%    2731   3425   12%    3836   6479   14%
------------------------------------------------------------------
Total   4150   5524   10%    6076   7773   13%    8793  14003   12%

4 - Personal Computers

        1986   1989  86-89   1990   1992  90-92   1993   1997  93-97
        ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large   5000   6475    9%    7058   8386    9%    9140  12902    9%
Small   5000   6475    9%    7058   8540   10%    9394  14261   11%
------------------------------------------------------------------
Total  10000  12950    9%   14116  16926   10%   18534  27163   10%

5 - Displays

        1986   1989  86-89   1990   1992  90-92   1993   1997  93-97
        ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large   2954   3518    6%    3729   4112    5%    4317   5248    5%
Small   1266   1466    5%    1539   1664    4%    1731   2025    4%
------------------------------------------------------------------
Total   4220   4984    6%    5268   5776    5%    6048   7273    5%
```

```
          -----Short term------Intermediate term--------Long term-----
```

6 - Industry Workstations

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	2285	3041	10%	3345	4122	11%	4575	7199	12%
Small	760	1068	12%	1196	1582	15%	1819	3181	15%
Total	3045	4109	11%	4541	5703	12%	6394	10380	13%

7 - Tape Storage

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	1695	2019	6%	2140	2315	4%	2407	2816	4%
Small	565	712	8%	769	897	8%	968	1317	8%
Total	2260	2731	7%	2909	3211	5%	3375	4133	5%

8 - DASD Storage

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	3070	3761	7%	4024	4781	9%	5211	7356	9%
Small	1030	1334	9%	1454	1791	11%	1988	3019	11%
Total	4100	5095	8%	5478	6572	10%	7200	10375	10%

9 - Printers

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	3400	4283	8%	4626	5296	7%	5667	7154	6%
Small	2300	3061	10%	3367	4075	10%	4482	6098	8%
Total	5700	7344	9%	7993	9371	8%	10149	13252	7%

10 - Telecom Equipment

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	7800	9555	7%	10224	11488	6%	12177	14246	4%
Small	7000	8575	7%	9176	10505	7%	11240	15293	8%
Total	14800	18131	7%	19400	21993	6%	23418	29538	6%

```
          -----Short term------Intermediate term--------Long term-----

11 - Other Peripherals

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR   ($m)   ($m)  AAGR   ($m)   ($m)  AAGR

Large     1350   1797    10%  1977   2392    10%  2631   3579     8%
Small      440    618    12%   692    853    11%   947   1288     8%
----------------------------------------------------------------------
Total     1790   2415    10%  2669   3245    10%  3578   4867     8%

12 - Systems Software

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR   ($m)   ($m)  AAGR   ($m)   ($m)  AAGR

Large     6000  11440    24% 14185  20427    20% 24512  44383    16%
Small     1500   3001    26%  3781   5813    24%  7208  14947    20%
----------------------------------------------------------------------
Total     7500  14440    24% 17966  26240    21% 31721  59330    17%

13 - Maintenance Services

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR   ($m)   ($m)  AAGR   ($m)   ($m)  AAGR

Large    11550  15373    10% 16910  19724     8% 21302  28981     8%
Small     3910   5347    11%  5936   7313    11%  8118  12323    11%
----------------------------------------------------------------------
Total    15460  20720    10% 22846  27038     9% 29420  41305     9%

14 - Applications Software

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR   ($m)   ($m)  AAGR   ($m)   ($m)  AAGR

Large     5400   9331    20% 11197  15067    16% 17478  29520    14%
Small     2900   5266    22%  6424   8945    18% 10556  19112    16%
----------------------------------------------------------------------
Total     8300  14597    21% 17622  24013    17% 28034  48632    15%

15 - Professional Services - Education Services

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR   ($m)   ($m)  AAGR   ($m)   ($m)  AAGR

Large      870   1503    20%  1804   2598    20%  3117   6464    20%
Small      470    812    20%   975   1403    20%  1684   3492    20%
----------------------------------------------------------------------
Total     1340   2316    20%  2779   4001    20%  4801   9956    20%
```

```
          -----Short term------Intermediate term--------Long term-----

16 - Professional Services - Custom Programming

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large     5389   8196    15%   9425  11613    11% 12890  16897     7%
Small     1340   2146    17%   2511   3263    14%  3720   5447    10%
------------------------------------------------------------------
Total     6729  10342    15% 11936  14876    12% 16611  22343     8%

17 - Professional Services - Consulting

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large     1454   2513    20%   3015   4198    18%  4954   8969    16%
Small      610   1054    20%   1265   1791    19%  2132   4133    18%
------------------------------------------------------------------
Total     2064   3567    20%   4280   5989    18%  7085  13102    17%

18 - Professional Services - Facilities Management

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large      815   1027     8%   1109   1293     8%  1397   1831     7%
Small      100    126     8%    136    159     8%   171    225     7%
------------------------------------------------------------------
Total      915   1153     8%   1245   1452     8%  1568   2056     7%

19 - Professional Services - Systems Integration

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large     1362   3579    38%   4940   6995    19%  8324  14059    14%
Small      150    412    40%    576    900    25%  1125   2334    20%
------------------------------------------------------------------
Total     1512   3991    38%   5516   7895    20%  9450  16393    15%

20 - Processing Services - Batch Processing

          1986   1989 86-89   1990   1992 90-92   1993   1997 93-97
          ($m)   ($m)  AAGR    ($m)   ($m)  AAGR    ($m)   ($m)  AAGR

Large     1064   1267     6%   1343   1509     6%  1600   1600     0%
Small     2480   3124     8%   3374   3863     7%  4133   4652     3%
------------------------------------------------------------------
Total     3544   4391     7%   4717   5372     7%  5733   6252     2%
```

```
         -----Short term------Intermediate term--------Long term-----
```

21 - Processing Services - Processing FM

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	1666	2468	14%	2814	3657	14%	4169	7041	14%
Small	1100	1464	10%	1611	2167	16%	2514	4874	18%
Total	2766	3932	12%	4424	5824	15%	6683	11915	16%

22 - Telecom Services - VANs

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	259	543	28%	695	1001	20%	1201	2029	14%
Small	150	345	32%	455	700	24%	868	1572	16%
Total	409	888	29%	1151	1701	22%	2070	3601	15%

23 - Telecom Services - RCS

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	4000	5471	11%	6072	6952	7%	7439	9042	5%
Small	4264	6153	13%	6952	8260	9%	9003	11802	7%
Total	8264	11623	12%	13025	15212	8%	16442	20844	6%

24 - Telecom Services - Online DB Services

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	2194	3605	18%	4254	5823	17%	6813	11506	14%
Small	1000	1728	20%	2074	2986	20%	3583	6947	18%
Total	3194	5333	19%	6327	8809	18%	10396	18453	15%

25 - Financial Services

	1986 ($m)	1989 ($m)	86-89 AAGR	1990 ($m)	1992 ($m)	90-92 AAGR	1993 ($m)	1997 ($m)	93-97 AAGR
Large	3240	3969	7%	4247	5046	9%	5500	8052	10%
Small	3150	4079	9%	4446	5479	11%	6081	9569	12%
Total	6390	8048	8%	8693	10524	10%	11581	17621	11%

```
          -----Short term------Intermediate term--------Long term-----

26 - Other DP Services

           1986     1989 86-89    1990     1992 90-92    1993     1997 93-97
           ($m)     ($m) AAGR     ($m)     ($m) AAGR     ($m)     ($m) AAGR

Large       380      563   14%     642      864   16%    1002     2009   19%
Small        50       86   20%     104      144   18%     170      377   22%
------------------------------------------------------------------------------
Total       430      649   15%     745     1008   16%    1172     2386   19%

*** GRAND TOTAL ***   (Not including 25-Financial Services)

           1986     1989 86-89    1990     1992 90-92    1993     1997 93-97
           ($m)     ($m) AAGR     ($m)     ($m) AAGR     ($m)     ($m) AAGR

Large     87842 124021   12%140098 174041   11%194547 292277   11%
Small     47335  66030   12% 74155  93293   12%104954 166308   12%
------------------------------------------------------------------------------
Total    135177 190052   12%214254 267334   12%299501 458585   11%

*** TOTALS #1-13 ***

           1986     1989 86-89    1990     1992 90-92    1993     1997 93-97
           ($m)     ($m) AAGR     ($m)     ($m) AAGR     ($m)     ($m) AAGR

Large     62989  83955   10% 92788 112470   10%124163 181309   10%
Small     32721  43314   10% 47699  58710   11% 65293 101342   12%
------------------------------------------------------------------------------
Total     95710 127270   10%140486 171180   10%189457 282651   11%

*** TOTALS #14-26 ***

           1986     1989 86-89    1990     1992 90-92    1993     1997 93-97
           ($m)     ($m) AAGR     ($m)     ($m) AAGR     ($m)     ($m) AAGR

Large     28093  44035   16% 51557  66616   14% 75884 119020   12%
Small     17764  26795   15% 30903  40062   14% 45742  74535   13%
------------------------------------------------------------------------------
Total     45857  70831   16% 82461 106678   14%121626 193555   12%

*** GRAND GRAND TOTAL ***

           1986     1989 86-89    1990     1992 90-92    1993     1997 93-97
           ($m)     ($m) AAGR     ($m)     ($m) AAGR     ($m)     ($m) AAGR

Large     91082 127991   12%144345 179087   11%200047 300329   11%
Small     50485  70110   12% 78602  98772   12%111035 175877   12%
------------------------------------------------------------------------------
Total    141567 198100   12%222947 277858   12%311082 476206   11%
```

INDUSTRY LEADER DISCUSSION FORMAT

Name: _____   Company:_____

Date:_____

Interviewer:_____

We are taking a look at the IS industry from a high level perspective. As far as 10 years. Looking for major influences, changes, "megatrends", if you will. I'd like to ask you what you think the major influences and their impacts will be on our industry. I'd also like to tell you a few of the ideas we've come up with and get your opinion about them:

For example, we've identified the following issues and influences:

(Cite 4-5 pre-determined specifics from our study)

What is your opinion? _____

What have we missed? _____
(take copious notes?

Choose from among:

- Social
- Political/Regulatory
- Industry Out Sourcing
- Industry Structure
- Government Influence
- Productivity
- Dispersion/Outreach of IS to "Front Lines"
- Strategic Information Networks
- Roles of IS Department
- Structure and Organization of IS
- Budgets
- Make or Buy
- Buying Process
- Applications Development
- Internal/External EDI (Electronification)
- Maturity/Penetration/Obsolescence
- People
- Open Systems/Standards
- Security

INPUT

IV U.S. Domestic Marketplace

- **Characteristics**

    - **Social**

        1. Degradation of quality and dependability of workforce.

        2. Reduced work ethic, lack of vocational training.

        3. General movement away from printed media to graphic/entertainment media.

        4. Moral breakdown, instant gratification, drug abuse.

    - **Political/Regulatory**

        1. Policy shift toward protectionism, limiting market growth

        2. Growing success in asserting proprietary rights: patents, copyrights, "look and feel" rights.

        3. Deregulation of certain industries causes decline in number of players, adversely affecting job creation.

    - **Economic**

        1. Assume an average inflation rate of 3% per annum.

        2. Assume an average GNP growth of 2% per annum.

    - **Industry Outsourcing**

        1. Continued migration of manufacturing offshore, some R&D and design also.

        2. Significant growth in offshore SW coding (not design).

        3. Migration of other elements: sales, marketing, distribution, support, services, most software: will not be significant.

    - **Industry Structure**

        1. Continued consolidation via mergers and acquisition in nearly all sectors.

        2. Differing vendors and vendor types in different applications/usage sectors.

INPUT

- Government Size and Influence

    1. Will slow somewhat, but still grow faster than GNP.

    2. States will grow early, through 1992, federal government will predominate later.

    3. Mission-critical system implementation will gain in importance dramatically.

    4. New legislation will drive major revisions to IS systems in private sector.

    5. Some Gramm-Rudman erosion apparent in short and intermediate term, probably reversal leter.

    6. Big, outside procurements, (like FTS 2000) in the winds.

    7. Government influence on standards making will be strong, but not overwhelming.

GLOBAL ISSUES

- Productivity

    Moving to information-intense service economy. White collar productivity is critical.

    Manufacturing sector will re-orient functions around automation to increase efficiency.

    Substantial compression of organizational layers and greater individual participation through intertactive IS.

- Outreach: Periphery of IS will move out to the "front lines" via networking to workers, customers, suppliers.

- All this will drive business trends:

    • Hardware more reliable

    • Connectivity enhanced

    • Operation simplified

    • Software more flexible, adaptive, responsive (AI may help)

    • Interactivitly will predominate

    • Processing (and in many cases data) will migrate outward from the hub

INPUT

- **I.S. ISSUES**

  - Role of IS Department

    Consultative
    Advisor, not always buyer
    Qualifier, standard setter
    Operate "corporate" systems

    - Networks
    - Consolidation of information
    - Planning data
    - Corporate data base
    - Software library

    Protect corporate assets

    - Network integrity
    - Data
    - Software

    Will often be instigator and focal point for new cross-functional
    mission-critical systems

- Structure/Organization of IS

  1. Rise in stature, less operational, less often dominated by finance dept.

  2. Business knowledge more important.

  3. IS functions fan out to other elements of company

  4. New CIO may not be IBM central DP-oriented.

  5. Post-implementation support increases in importance.

  6. Budgets and buying will migrate to business clients who have P&L
     responsibility.

  7. IS "Spin-off" units will split into legitimate segments, one internal and one
     external, pure profit center.

  8. Also, some big companies may go the other way, spinning off all IS to
     arms length subsidiaries or acquisitions.

- Budgets (IS Expenditures)

  1. Will continue to rise but from different quarters and for different activities.

  2. Networks, Office Systems, Operational Automation, Internal/External EDI will increase.

  3. Traditional central IS budget will decline as authority is disseminated and applications change.

  4. Account control for vendors becomes increasingly complex and difficult.

  5. Industry Growth:

Present rate in	S (1986-1989)
Increase in	I (1990-1992)
Moderation in	L (1993-1997)
Limits:	Availability of capital
	Lack of standards
	Short-lived products
	More expensive sales, marketing, support
	Complexity

     This will drive industry consolidation via M&A

  6. Implementations will be staged, reducing risks but:
     - Raising costs
     - Postponing benefits
     - Straining people and other resources

- Make vs. Buy

  1. IS department is high risk choice because people don't know the business operation and are limited to experience on one, their own, company.

  2. Outside vendor is less risk because he has multiple, similar experiences and has specialized subject knowledge. Control is maintained by operating people in the company who know what they want.

  3. SSS: *Single Source Solution.* Vendor has all the parts.

  4. SPA: *Single Point Accountability.* Vendor puts the parts together

5. Assertion:

   A. Systems will be increasingly large and complex.

   B. More of them will be forced outside. (Internal IS has poor track record)

   C. Vendor relationship will swing from SPA more to SSS with passing time, increasing cost-effectiveness and degree of integration.

6. For vendors, the greater the responsibility shouldered, the greater the reward.

- Buying Process

   More decision points

   More team decisions

   More types of people involved

   More testing and "fly offs" required

IS pre-qualification of products may make actual buying decision simpler out at the periphery.

- Applications Development

   1. Increasingly, vendor originated

      - More competent

      - Broader experience

      - Shared development cost

   2. Company development will migrate increasingly to operating department and individual level.

   3. Many applications are relevant only locally. Will observe interface standards, pre-process data and feed corporate system only what it needs, in digestible form.

   4. Contervailing influence:
      Companies will discover that time and resources are being frittered away on sub-rosa, ineffective development, especially at end-user level. Too much "hacking."

- People

  1. Gating factor

     Potential solutions exist:

     - CASE

     - SW Productivity Tools

     - 4GLs

     - AI/Expert Systems

     - Offshore coding

  2. To accommodate people, will foster flexible work hours, conditions, location; "Telecommunicating" will rise.

  3. Costs of qualified, dependable people will go up.

  4. Industry will reach more and more into ranks of stay-at-homes and retirees

- Open Systems/Standards

  1. Essential to accomplishment of improved competitive position of U.S. Therefore, inevitable

  2. But _slow._ Resistance, inertia is strong.

  3. In some cases, incompatibilities and diversions from standards will be overcome via special devices, software, emulators, interfaces, converters and the like. (Represents niche markets, at least in the short and intermediate term.)

- Security

  1. Growing problem, not being addressed.

  2. Proper security is a competitive, legal requirement.

  3. Data assets must be protected from "harmful interdiction."

  4. There is, undoubtably, more damage than meets the eye.

  5. May be a major catch-up effort, probably during the intermediate time frame, when a series of alarming incidents come to light.

INPUT

- **Internal and External EDI**

    1. Could be called "Electronification." Creation, exchange and storage of "documents" becomes wholly electronic.

    2. Competitive pressures dictate cost reduction, efficiency improvement, profit enhancement via less handling, more timeliness of information, broader sharing, upstream and downstream linkage.

    3. Implications:
       Need for standards
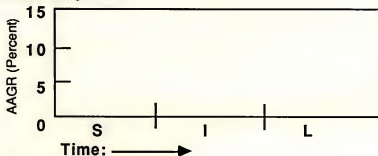   Security and control issue
       High risks

    May focus attention on real time, at expense of strategic concerns

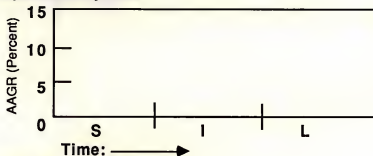   Increased workload for networks: could become overburdened.

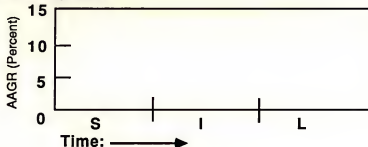- **Maturity, Penetration, Obsolescence**

- **Expenditure Growth**

    1. **Central IS Systems:**

    2. **Departmental Systems**

    3. **End-User Systems**

*AAGR = Average Annual Growth Rate.

SEGMENT GROWTH

CENTRAL I.S.

IBM	Cullinet
Amdahl	CA
Tandem	UCCEL
	Sterling

NETWORKS

IBM	McDonnel Douglas
AT&T	EDS
GEISCO	GTE

DEPARTMENTAL - OFFICE SYSTEMS

Wang	DEC
IBM	DG
Apple	

DEPARTMENTAL PROCESSING SYSTEMS

DEC	Computervision
IBM	SUN
HP	Apollo
Prime	Applicon
ADP	Intergraph

END USER SYSTEMS AND SERVICES

IBM	MICROSOFT
APPLE	COMPUSERV
LOTUS	
ASHTON-TATE	

INDUSTRY-SPECIALIZED SYSTEMS AND SERVICES

NCR	IBM-HOGAN
ADP	
SMS	

INPUT